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Improvement in Bond Trading

The full extent of the improvement in general business conditions in the last few weeks is shown by various indications. The one which is of leading importance is the change in the financial situation. For the first time since the war was started four months ago trading in bonds is a real factor in the situation. Inquiries are reported, bond offerings by established banking houses are appearing, prices are fairly stable, and definite notice has been given that the long-awaited opening of the New York Stock Exchange for restricted dealings in bonds will take place on Nov. 28. If trade here can be strengthened to its normal state and the banking position reaches a point where the authorities pronounce it safe, business men can look forward with much easier minds to the questions of international financial importance which are in the future. The problem which is of immediate concern to many public utility companies is that of the probable date when new financing can be arranged at economical rates. Without waiting for the broad general market which will be available at some later day that cannot now be marked on the calendar, several companies are successfully undertaking the sale of securities in a small way to provide for current needs. That it is possible to do as much of this as has been done, though the aggregate amount involved is small when compared with the regular investment buying power of the country, reveals an improvement that is highly encouraging. Barring the possibility of a sudden sweeping reversal in the present trend of affairs, improvement of this kind will continue proportionately with the growth of confidence. The Federal Reserve banks, which opened with no display of the power that they will have over financial conditions, are undoubtedly exerting already a silent, forceful, steadying influence which means as much sentimentally as practically.

Municipal Ownership in Cleveland

An account of conditions in Cleveland and of the state of the competition between the established private plant and the new municipal plant is published elsewhere in this issue. The city of Cleveland has adopted methods that have put it in possession of a plant which, if it does any sizable amount of business, must do so by duplicating the service and facilities of the existing efficient private company. It has also, in further exercise of its power, made rates for the company which have been appealed to the State Public Utilities Commission, the authority which can control private-plant rates but not municipal-plant rates. The fair, proper remedy for the city if it had grievances did not lie in the use of both of these alternatives. If it chose to compete with the private plant, it could fairly have left the private plant free to compete with it; but since it had adequate means of regulation through the state commission, it might more justly have left the question of reasonableness of rates to that body. As the city stands now it is in the triple rôle of competitor, regulator (subject to the overruling decision of the State commission) and user of the service of the private company. There are two essential things which it is not doing—(1) furnishing the capital for the large investment of the private company; (2) furnishing the initiative, ability and organization which supply the overwhelming proportion of the good private service enjoyed by the citizens. No sound basis in economics can be found for the wasteful duplication of plant facilities in which the city has engaged. The fact that its expenditure and its plant are relatively small as compared with the investment and plant of the private company does not lessen the economic wastefulness of its policy in principle. Large or small, any expenditure that duplicates existing facilities which provide good service, where the reasonableness of rates may be submitted to a state commission, is inexcusable.

Short-Time Lighting Loads

One of the pestilent problems which beset a central-station manager in many small towns is that of dealing with the customer who wants lighting service for eight or ten weeks at most and looks with horror on anything which approximates paying a fair price for it. Many a good-natured manager has erected two or three miles of line to accommodate ten or a dozen customers whose aggregate bills are hardly sufficient to pay for the insulators. Moreover, in nine cases out of ten the installation has not even a fighting chance of paying for itself by the load obtained along the way. Just what to do with the demand of this class of customers it is not always easy to say. In many cases a special rate is established reasonably high in appearance yet very seldom actually recouping the station for its pains. No ordinary form of demand system can cope with the problem, since it is not the demand which is at issue, but the great distance of the load. The best way out of the difficulty in such cases is actually to charge the construction to the distant subscribers, perhaps letting the charge take the form of a minimum monthly bill until the account is squared. In the case of an unreasonably long line to be built to serve very few customers the customers should pay for the construction and no attempt should be made to levy special rates.

A New Radio-Frequency Oscillator

On page 1048 of this issue we present the authentic information available at this time with regard to the new alternating-current generator of Dr. Peter Cooper Hewitt. A simple vacuum-tube oscillator producing sustained waves of considerable power at high frequencies is bound to find valuable application in radiotelegraphy, and if the device embodies in itself some "trigger" action whereby its output in power or frequency can be quantitatively altered in large amounts by the application of small electric forces the apparatus will be valuable for radiotelephony. Its economy and efficiency in continuous operation at high powers are still unknown, but should the present indications be borne out the new oscillator should prove a strong competitor of the hydrogen arc and mechanical generators now in use.

The commercial utility of ultra-sensitive receivers is more difficult to grasp, for the reason that in radiotelegraphy—as in line telephony—the instruments now in use are so delicate that interfering disturbances produce disproportionally strong effects. Progress is more to be expected from increase of transmitting ability and from electrical reduction of "atmospherics" than from added sensibility in the receiving instruments. For this reason the new oscillator is arousing more interest than is the receiver, though the engineering public will be glad to learn of the operation of both devices as soon as full disclosures can be made.

The Larger Market for Electric Energy

A presidential address before the British Institution of Electrical Engineers is nearly always an important contribution to the art, and the recent address of Sir John Snell, abstracted elsewhere in our columns, is no exception to this rule. From a practical American standpoint the most interesting portion of the document is that which deals with the aspects of the larger field for electrical supply which is now opening up, and particularly the question of ultimate price in its relation to such supply. Sir John Snell takes a rather conservative view of the bulk-supply problem; indeed, he is decidedly less optimistic regarding the great gains from generation upon a particularly large scale than are most engineers in our own country, holding that under existing circumstances the extra operating cost of an addition to a well-organized local station is often cheaper than any practicable form of bulk supply. There is no doubt that the situation with respect to the economy of great stations has changed materially in recent years. Particularly since the introduction of highly economical turbo-generators there has been a tendency to decrease the difference in cost as between medium-sized and very large stations to an extent that scarcely seemed possible a few years ago. The main point of Sir John Snell's contention is that once a station is fairly in operation and the capital charges incurred the gain from bulk supply, unless obtained at a very low price indeed, is frequently little or nothing. He readily grants, however, that the bulk-supply question should be carefully looked into before undertaking to build a new station.

From the standpoint of the central-station man the most hopeful part of the address is the great progress that has been made in some of the British plants regarding domestic supply, and particularly for purposes other than lighting. As our readers may know, for several years a vigorous effort has been made by British central-station managers to exploit the use of electricity for heating, cooking and similar purposes, and the efforts have met with a very gratifying degree of success. Although individual districts vary very greatly in such matters, instances have been found in which the proportion of such load to the lighting load is as high as ten to one. Such figures as these one must, of course, consider at present exceptional, but all the indications from the British experience go to show a great and profitable field in the miscellaneous and domestic uses of energy. Not only is the bulk of business large, but it is particularly advantageous in being essentially off the peak, at least under British conditions. In one station having some 15,000 kw connected, inclusive of a large amount of heating and cooking—an amount reaching a third of the total load—it was found that the addition of this amount produced no perceptible effect whatever on the maximum demand. The diversity-factor of this class of load is certainly great, so that from the standpoint of investment it is most attractive. The English experience with it teaches the necessity of offering low rates, although it is a well-paying load even at the prices charged. These are usually based on some form of equipment charge plus a very low service rate, commonly 2 cents per kw-hr., sometimees as low as 1 cent.

Following up the subject of rates, President Snell points out what is far too often forgotten, that in a modern central station the constant tendency is to reduce the importance of fuel as a factor in the costs. In generation on a large scale he estimates the whole generating cost at about 30 per cent of the total, nearly half of which must be reckoned as capital charges which represent permanent investment in plant and distributing system. Even if by some extraordinary improvement in generation the cost of coal could be eliminated entirely, the possible reduction in price of the consumer would be only about one-fourth of the total, so that one cannot reasonably expect, from now on, any considerable reduction in price due to improvements in generation. Business of a kind which may fully utilize the investment stands a good chance, however, of helping legitimately to lower the price. From the standpoint of supply the operating expenses at the station are steadily decreasing in importance, and the necessity of operating the system to the best advantage to obtain large and steady load becomes predominant. It will pay some of our American central-station managers to investigate thoroughly the English experience in developing domestic load other than lighting, particularly since improvements in lamps are likely steadily to decrease rather than to increase the importance of the

lighting load. The keynote of success in future central-station work is to make electricity a necessity in the daily life of every man to an extent that has not hitherto been approached.

Radiation from Straight and Helical Filaments

The gas-filled tungsten lamp, as recently introduced into practice, not only manifested itself as a novelty but also introduced some novel problems into photometry and radiation measurements. In order to keep the loss of heat by convection from the surface of the glowing filament to suitably small limits, the filament is spiraled, and a question arises as to the influence of this spiraling of the filament on its luminous efficiency. It is generally admitted that the greater luminous efficiency of tungsten-filament vacuum lamps over carbon-filament vacuum lamps is attributable to two distinct causes combined; namely, first, their capability of withstanding a higher operating temperature without evaporation or disintegration, and, second, their selective character of radiation at working temperature. The higher the temperature of any glowing body, the greater is the ratio of its visible to total radiation, and therefore the greater its luminous efficiency. A metallic radiator which, when incandescing, emits a larger percentage of visible radiation than a "black body" at the same temperature possesses an inherent advantage in luminous efficiency due to this selective radiation.

A "black body" is the name of an ideal substance which is powerless to reflect radiation. At any temperature it is a perfect non-reflector. It therefore radiates non-selectively, strictly according to its temperature. The nature of the radiating substance, and especially the condition of its surface, determine how nearly a radiator approaches a black body. A roughened, dirty and irregular surface tends to radiate blackly; whereas a polished, clean and smooth surface tends to radiate selectively, or in the manner of a reflector. Untreated carbon filaments are nearly black in their radiation, but metallized carbon filaments are distinctly more selective. Tungsten, for a given surface quality, radiates more selectively and less blackly than carbon. It was shown by Kirchhoff that any metallic inclosure like the inside of an oven with a small aperture for observation behaves substantially like a black body, whatever the surface and metal may be. That is, the radiation escaping from a small aperture of an oven is non-selective, owing to the sifting by continual reflections from the internal walls; whereas if the oven were sufficiently hot to glow externally its external radiation might be selective, or gray as distinguished from black.

When a tungsten filament is rolled into a spiral, how far does its radiation lose in efficiency by coming from the inside of the spiral, regarded as an oven and as an approach to a black body? If the entire filament were "black," it would lose all of the luminous efficiency due to its selective radiation and retain only that due to its high operating temperature. This is the question which Dr. W. W. Coblentz seeks to answer experimentally in the investigation he describes in this issue. The article indicates that, although a certain amount of blackening in the radiation occurs owing to the action of the inner walls of the spiral, yet the effect is relatively small and is much more than compensated for by the reduction in convection loss due to the spiral form. The experimental method employed is an interesting one.

Atmospheric Refraction of Electromagnetic Waves

The emission of electromagnetic waves from a simple dumbbell Hertzian oscillator, assumed to be operated in free space and far from this earth or any other conductor, is supposed to be transmitted in simple straight lines from the oscillator as a point source, just as we have reason to believe that light travels. When, however, the oscillator is set vertically, with the ground as counterpoise, the waves do not proceed rectilinearly but bend around the conducting surface of the earth. In this respect radiotelegraphic waves differ from ordinary light waves. The marked influence of the weather, season of the year, time of day and other meteorological conditions upon the strength of radio signals as received at a great distance indicates that the transmiscion is profoundly affected by causes resident in the atmosphere. Various conjectures have been made to account for such causes.

In a recent article published by the London *Electrician*, referred to in this week's Digest, Dr. J. A. Fleming presents some interesting suggestions as to the effect of pure refraction on the path of electric waves emitted horizontally at some point on the earth's surface. If we assume that the refractive index of the gases composing the atmosphere is substantially the same for long radio waves as for short light waves, then there is a certain relation between the density and the index of refraction for each gas at which it will produce circular refraction and prevent the waves from escaping above the atmosphere. Whether these conditions are met with completely in the earth's atmosphere or not, it is evident that the influence of ordinary refraction is to bend the waves over and to retain them much longer in the neighborhood of the earth than if refraction were non-existent.

Dr. Fleming suggests that the conditions existing in the atmosphere of our earth may be particularly favorable to the transmission of long-distance radiotelegraph signals, and that, considering the great variations which exist in planetary atmospheres, it is possible that our earth is unique in this respect. We can lay, then, the flattering unction to our souls that this world may be the best of worlds in respect to the refraction of long-distance radio electromagnetic waves, a blessing in which no doubt some of our more spiritually minded readers may perceive a direct intervention of Providence. However, some benefits ought to be allowed, on the doctrine of uniformity in compensation, to a planet like ours possessing only one moon, in view of the numerous moons allotted to other planets and their opportunities to dispense with artificial light at night time.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Los Angeles to Condemn Distributing System

After preparatory studies covering several months, the city attorney of Los Angeles was instructed on Nov. 17 to institute proceedings in the Superior Court of Los Angeles County for the condemnation of the Southern California Edison Company's distributing system in that city. A petition is being filed with the Railroad Commission asking that body to fix a price to be paid for the property, which the city desires to use as a distributing system for electrical energy generated by aqueduct power plants.

New York Merchants and Prosperity

The Members' Council of the Merchants' Association of New York held a "prosperity" lunch at the Hotel Astor, New York, on Nov. 24. It was attended by 1625 people and was held primarily to celebrate the "promotion of business prosperity by Federal Reserve banks." Among those who made addresses were Gov. Benjamin Strong, Jr., of the Federal Reserve Bank of New York.

A bulletin issued by the Merchants' Association says that one of the noticeable features in the development of American trade during the last five years has been a remarkable increase in the exports of American electrical machinery, apparatus and supplies. "American electrical equipment," it adds, "has won a high reputation in the various foreign markets, and the increase in sales has been secured almost entirely on merit, for comparatively few American producers have made any serious attempts to push their products in the foreign market." Special attention is called to the market created by hydroelectric development in foreign countries.

The Federal Trade Commission

Reports that President Wilson will probably name as members of the new Federal Trade Commission, which is soon to be organized, certain members of the House of Representatives and the Senate who were defeated for re-election, and who are popularly known as "lame ducks," are found, upon inquiry in Washington, to have no basis in fact.

It is said in Washington that nothing has occurred to change the generally accepted idea that Mr. Joseph E. Davies, commissioner of corporations, will receive a place on the commission, although not necessarily as chairman. A report that Secretary Redfield would head the commission was characterized by him as "a crazy dream." It is said in Washington that President Wilson has under consideration the name of former Judge Edward M. Cullen, of New York, as a member of the commission.

It was understood originally that President Wilson would name the commission about Dec. 1. Since that was announced, however, it has become understood in Washington that the administration does not intend to "rush into" any of the administrative features of the new trust legislation. The opinion of a frequent visitor at the White House is that President Wilson thinks there has been enough discussion of finance and commerce for awhile and believes in "giving business a chance." As the Senate will have to confirm the appointments and could not reach that business until well after assembling in December, there is not believed to be any necessity for hurry.

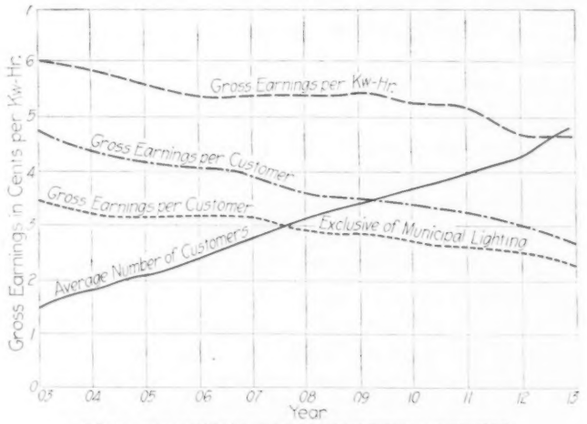
Report on Electric Rates at Cincinnati

A valuation of the electrical equipment and property of the Union Gas & Electric Company, Cincinnati, Ohio, together with an analysis of the rates charged by the company for electric service, has just been submitted to the director of public service of the city administration by Mr. Arthur C. King, Chicago, following an engineering investigation into the company's operations. The company will reply to the report later.

The city's engineer places the valuation of the property used for furnishing electric service in Cincinnati at $6,848,760.31, based on a reproduction cost new of $7,952,893.79 diminished by an existing depreciation of $1,104,133.48. No allowance was made for intangible value, but the figure of $241,673 was assigned for working capital.

The income accounts for the twelve months ended June 30, 1914, were examined and adjusted, the final figure for Cincinnati's business being $2,023,835.61. From these figures the net earnings were computed to have been $1,182,865.70. The amount allowed as a deduction from net earnings to offset future depreciation is $284,921.82.

A return of 8 per cent, or $567,234.66, is allowed as representing the interest or return to the owners for the use of their property.



DATA ON UNION GAS & ELECTRIC SYSTEM

Deducting the depreciation reserve and return on investment from the adjusted net earnings arising from the present business and rates, a surplus of $330,709.22 is declared to remain to be utilized in rate deductions. Mr. King recommends that a reduction be made in all rate schedules, the reduction to total approximately the above figure, and that the maximum rates of all classes of electric business be reduced accordingly.

Death of Chairman Barker

Chairman Forrest E. Barker, of the Massachusetts Gas and Electric Light Commission, died suddenly at Washington, D. C., on Nov. 20, while in attendance upon the convention of the National Association of Railway Commissioners. Accompanied by Mrs. Barker, he had been away from Boston for about a week, and while his health had not been good for some time, his death was unexpected and was a great shock to his associates. Mr. Barker was born in Exeter, N. H., in 1853, was graduated from Wesleyan University, Connecticut, in 1874, and later took up the study of law at the Boston University Law School. After being admitted to the bar, he practised law in Worcester, Mass., serving on the school board and representing his district in the Legislature in 1883-4. He was also at one time chairman of the Republican Congressional district committee and from early manhood was prominent in Masonic circles, having attained the thirty-third degree and held many honors in affiliated fraternal organizations.

In 1885 he was appointed a member of the Gas and Electric Light Commission by Governor Robinson of Massachusetts, the board having just been created by the Legislature along the lines of a bill drafted by Mr. Barker himself. The regulation of these utilities was then in its infancy, and in the pioneer days of the commission Mr. Barker rendered invaluable service to the State, becoming chairman of the board in 1894 after nine years of fundamental and painstaking effort to establish and maintain a constructive policy which should be just to the public and the companies alike. Of a conservative temper of mind, he was thoroughly alive to the progress of the great industries under his supervision and responsive to the needs of the consumer and the welfare of the general public. All through his chairmanship Mr. Barker strove to administer justice with conscientious and unsparing labor, and while his mind was of the deliberate type, it worked with great precision and adhered with the utmost tenacity to decisions reached. It is to a large extent due to him that the policies and decisions of the commission have been extraordinarily free from inconsistencies; that the board has been growing stronger year by year in its grasp of the important problems placed before it, and that its acts have been sustained and reinforced by the courts and the Legislature. That the commission was not abolished at the time of the creation of the Public Service Commission in 1913 was in no small part due to the years of devoted service and wise direction given by Mr. Barker in his responsible office.

In speaking of Mr. Barker, Gen. Morris Schaff, associated with him on the board since 1893, expressed the heavy loss which the commission has sustained and said that the late chairman was the ablest man with whom he had ever had the privilege of working; that he was the wise counselor of many other commonwealths in relation to public utility regulation, unswerving in his loyalty to the cause of right as he saw it and, while slow to reach a conclusion, possessed of a comprehensive grasp of the needs of the companies and the public, and firm in the support of his convictions. Both the companies and the public owe the deceased commissioner more than is realized, the former having extraordinary confidence in his sympathetic understanding, which also was not wanting in his treatment of the latter. Commissioner Weed also spoke feelingly of the board's affliction and commented upon the judicial qualifications of his late associate and the soundness of his views.

Gov. David I. Walsh of Massachusetts said that in the death of Mr. Barker the State has lost its ablest commissioner, and that as chief executive he had enjoyed the closest and most friendly relations with the late chairman, valuing his counsel upon every phase of commission work and relying upon him in many other ways, although the two were of different political faiths. Few if any of the Governor's advisers possessed his confidence to a greater degree and none had greater capacity in investigating and reporting upon the advantages and drawbacks of specific policies. The Governor said: "Mr. Barker loved the work, he was 'always on the job,' he was endowed with a peculiarly judicial mind, never giving offhand opinions, and he was a constructive thinker and administrator whose abilities were ever at the service of the State and whose counsel was of the greatest value in shaping legislation."

President Charles L. Edgar, of the Edison Electric Illuminating Company of Boston, said that in his opinion Mr. Barker was the best-posted man on public service in the country; that in twenty-five years' association with him relations of close personal friendship had come about between the two, and that the chairman's death is a heavy loss to the State and to the companies. Mr. Edgar said that Mr. Barker was entirely competent to run a public utility from the company end, that he was absolutely straight in every detail of his official life, and that he possessed the confidence of the public

THE LATE FORREST E. BARKER

no less than of the companies, although his work was quietly done, many of his best activities being employed in the informal adjustment of matters brought to his attention.

Mr. Everett W. Burdett, general counsel of the National Electric Light Association, said:

"The death of Mr. Barker is a serious loss both to the public service and to the lighting interests of Massachusetts. By reason of his long experience, his laborious and untiring studies, his infinite patience and his native ability he had long been the best equipped public service official in the State. While his methods were laborious and his processes sometimes circuitous, his conclusions were usually sound. I think one word more fitly expresses his leading characteristic than any other, and that word is 'wisdom.' Mr. Barker was wise in a large sense. He recognized both the reasonable demands of the public and the legitimate rights of the corporations. He held the scales so evenly that the contending interests with which he dealt usually came to recognize the propriety of his actions and the fairness of his decisions, however much they may have experienced the temporary sting of defeat."

Mr. A. Stuart Pratt, of the Stone & Webster Management Association, Boston, Mass., said that Stone &

Webster learned with sincere regret of Mr. Barker's death. The commission was the first in the United States to cover this class of public service; the experiment was approved by the people and served as a model which has been followed in many other states. Mr. Barker became a member of the board as a young man and had been largely responsible for its policy ever since. His wise counsel was a great benefit to legislature after legislature both in shaping good legislation and in suppressing bad. For a comparatively small salary he made his lifework the service of the State. Honest and conscientious always, he held the esteem of those who came in contact with him. By his death the people suffer a serious loss, as no matter how able may be the man who takes his place, the knowledge which Mr. Barker had acquired by his long years of service in respect to conditions both within and without the companies can be attained by no man except after similar years of arduous work.

Mr. A. B. Tenney, of C. H. Tenney & Company, Boston, also expressed a keen sense of the loss to the State which has come in the closing of Mr. Barker's life and spoke appreciatively of his painstaking, conscientious devotion to the duties of his office.

New Street-Lighting Contract for Boston

A new street-lighting contract was submitted to the Boston (Mass.) City Council on Nov. 18 by Commissioner of Public Works L. K. Rourke, following conferences with President Charles L. Edgar, of the Edison Electric Illuminating Company. The contract contains several concessions to meet the objections of the Council to previous drafts, the most important feature being a clause providing for compulsory arbitration of the price per lamp per year at the end of five years. The contract reads for a term of ten years, and the proposed price of $87.53 per 6.6-amp magnetite lamp is subject to arbitration by the Gas and Electric Light Commission immediately after approval by the City Council. It is also provided that the city shall be allowed 75 per cent of any future saving in carrying out the contract, and in case of disagreement between the city and the company between arbitrations each may select an arbitrator, the two selecting a third. A public hearing will be given on the contract on Dec. 1 at the Boston City Hall.

Western Association of Electrical Inspectors

Mr. J. H. Miller, general superintendent of the Otis Elevator Company, Chicago, will read a paper on "Elevator Control Wiring" at the annual convention of the Western Association of Electrical Inspectors, to be held at the Hotel Radisson, Minneapolis, Minn., Jan. 26 to 28. Hazards in electrical wiring and construction introduced by the use of nitrogen-filled tungsten lamps of large sizes, the motor operation of motion-picture machines, etc., will be among the topics to be discussed. President George E. Vincent, of the University of Minnesota, will also address the inspectors and on Thursday evening at the joint dinner with the local section of the A. I. E. E. Mr. C. H. Pillsbury, Minneapolis, will speak. Friday will be given over to local inspection trips. Coincidently with the sessions of the inspectors the Minnesota Electrical Contractors' Association and the Minnesota sections of both the A. I. E. E. and the A. S. M. E. will hold meetings. To celebrate its tenth annual convention, the inspectors' association will have the wives of its members present as guests on this occasion. Members from the Chicago territory will gather at Chicago, whence a special train is to be run to Minneapolis. Mr. W. S. Boyd, Insurance Exchange Building, 175 West Jackson Boulevard, Chicago, is secretary-treasurer of the association.

Meeting of Ohio Contractors

The Ohio Association of Electrical Contractors met in Dayton, Ohio, last week, for its semi-annual convention, about twenty-five members attending. President Charles Aull, of Cincinnati, presided, other officers present including Secretary F. M. Grant, of Cleveland, and Treasurer William G. Rauter, of Cincinnati. Many of the topics discussed at the meeting with the greatest interest fell under the "safety-first" classification, the contractors placing themselves vigorously on record against the wiring of houses already built by any except experienced men, and advocating stringent regulations governing wiring under all circumstances, in order to avoid the danger from fire which results from improper wiring. The State law giving municipalities the right to license contractors, of which Cleveland, Cincinnati and Youngstown have already taken advantage, was also discussed.

Ohio Electric Light Association Discusses New-Business Co-operation

A most interesting, instructive and largely attended meeting of the committee on new-business co-operation of the Ohio Electric Light Association was held at the Hotel Gibson in Cincinnati on Nov. 18, with approximately 100 delegates in attendance representing different central stations throughout Ohio, Kentucky and Indiana, together with a number of representatives of manufacturers of electrical apparatus in the vicinity of Cincinnati. The chairman of the committee, Mr. Thomas F. Kelly, sales manager of the Dayton Power & Light Company, presided. Mr. W. W. Freeman, president and general manager of the Union Gas & Electric Company of Cincinnati, extended a hearty welcome to the delegates and drew attention to the importance at this time of securing all the business possible at a minimum of expense. Mr. D. L. Gaskill, secretary of the association, responded and spoke of the fine work of the different standing committees of the association.

Mr. Dexter Rollins, of the Simplex Electric Heating Company, of Chicago, read a paper entitled "Industrial Heating as Power Business," which created considerable interest and was discussed thoroughly by Messrs. J. C. Matthieu, F. E. Morrison, L. C. Anderson, H. B. Bixler, T. J. Ryan, J. E. North, D. L. Gaskill, J. W. Schrantz and G. C. Gillie. At the close of the morning session the delegates adjourned to the Cincinnati Jovian League lunch room in the annex of the "blue fountain" room in the hotel, where they were addressed by Mr. W. C. Culkins, executive secretary Cincinnati Chamber of Commerce, on "Salesmanship."

At the afternoon session Mr. R. A. MacGregor, of the Toledo Railway & Light Company, presented a paper entitled "Vital Points on Power Sales Work." This paper also created a large amount of interest and a very hearty discussion. Among those who discussed the paper was Mr. Harry Adams, of the Nagel Electric Company, Toledo, Ohio, who drew attention to the spirit of co-operation that existed in Toledo, where business is sought for by representatives of the electric manufacturers, jobbers and central stations co-operatively. In this way the central station not only has its own means of securing the business but the help of the live representatives of the other concerns interested in the developments of the business in Toledo. Mr. Adams made the

statement that 8000 hp in motors had been sold in Toledo during the past year on long-time payments. A number of other delegates spoke of the same spirit of co-operation that existed in their different communities.

Secretary Gaskill drew attention to the standing offer of the committee on new-business co-operation to secure the services of an expert on motor load from some of the large central stations in Ohio for any small central stations in Ohio who wished to secure some particular piece of motor business. Following the discussion of this paper, the delegates went into a regular round-table discussion on different methods of securing business under the following headings: Electrical advertising, wiring of old houses, methods of selling electrical appliances, and methods of securing power business.

Practically all of the delegates had something to say as to what they were doing to secure these different classes of business. The meeting was one of the most profitable held in connection with the work of the committee since its inauguration the early part of 1914. The next meeting will be held in Cincinnati on Jan. 20, 1915. A tentative program has already been arranged.

Electrical Credit Association of Chicago

The nineteenth annual meeting of the Electrical Credit Association of Chicago was held at the Chicago Athletic Association on Nov. 19. In his address President A. O. Kuehmsted, Chicago, declared that the recent business depression has affected the electrical industry to a much less extent than other classes of business. The report of the secretary-treasurer, Mr. Frederic P. Vose, Marquette Building, Chicago, showed an enrolment of 232 members, an increase of thirty-seven during the year. Mr. F. M. Pierce reported on the national convention of electrical credit associations held at Buffalo in June, and Mr. H. E. Wilkins read the report of the nominating committee, which was unanimously accepted, officers being declared elected as follows: President, Mr. Henry Schwab, secretary and treasurer Monarch Electric & Wire Company, Chicago; vice-president, Mr. A. O. Kuehmsted, general manager Gregory Electric Company, Chicago; secretary-treasurer, Mr. F. M. Vose, Chicago; national representative, Mr. F. M. Pierce; members of the national committee, Messrs. Benjamin P. George and E. M. Hawley.

Moral-risk clubs and local business conditions were discussed by Messrs. C. C. Gray, Detroit Insulated Wire Company, Detroit; Ernest B. Dalton, Post-Glover Company, Cincinnati; W. J. Burton, Frank Adams Electric Company, St. Louis; E. W. Shepard, Western Electric Company, Cleveland; Edward Pfleger, Andrae & Sons Company, Milwaukee, and W. P. Vose, Chicago. Mr. Gray made the statement that he based his own credit allowances about one-quarter on the reports of the mercantile agencies and three-quarters on the reports furnished by the association. The matter of individual moral risk, he pointed out, is, however, more subtle, and the best results are gained from personal discussions between credit men at such meetings as the moral-risk club luncheons. The work of the Electrical Credit Association was discussed by Messrs. J. D. Meek, Indianapolis Electrical Supply Company, Indianapolis; W. P. Johnson, Manhattan Electrical Supply Company, Chicago, and C. C. Miner, Robbins & Myers Company, Springfield, Ohio.

"The Basis of Establishing Credit Limits" was the subject treated by Messrs. T. I. Stacy, Electric Appliance Company, Chicago, and Alexander J. Klein, M. Klein & Sons, Chicago. Evils of cash discount allowances after the lapse of the discount period were discussed by Messrs. J. N. Kirby, the Consumers' Rubber Company, Cleveland, and F. W. Seywert, Erner Electric Company, Cleveland.

Secretary F. P. Vose acted as toastmaster at the dinner in the evening, when addresses were delivered by Dr. J. T. Stone, Mr. E. D. Hulbert and others.

MR. WAKEMAN ON BUSINESS IMPROVEMENT

General Manager of Society for Electrical Development Sees Encouraging Factors

Mr. J. M. Wakeman, general manager of the Society for Electrical Development, Inc., expressed the belief, in talking with a representative of the *Electrical World*, that general business conditions are getting better each day.

"When the war was started," said Mr. Wakeman, "people in all parts of the country were almost as panic-stricken as if the conflict had involved this nation. At first general business was prostrated, but in the last few weeks it has been resuming its normal activity gradually and surely. I have been in touch with many men connected with the electrical industry in various parts of the country, and the only people I find suffering from the effects of the war are those whose financial support was obtained abroad and those whose communities include many factories that are largely dependent on export trade. Even among manufacturers who are largely dependent on export trade I find a number who state that business is becoming normal in every respect. For instance, in Cincinnati, where I am creditably informed the central-station motor-service load is above rather than below normal, machine-tool manufacturers are thriving upon the still existing foreign trade. From California reports are received of the largest crops in the history of the State and a demand therefor from European belligerent nations which promises consumption for the entire product at good profitable prices. From the Southern States we are getting reports which indicate that they are recovering from the depression that swept over them and that in some cities mills are now running on full time.

"I can see only one outcome of the situation. With the continent of Europe practically stopping production and the United States the only large country still producing, an era of larger business must follow. This, however, will not be forced upon us. Financiers and manufacturers in the United States must recognize that prosperity will come to those who seek it most diligently and that one of the first requisites in the struggle is confidence. We do not need to be over-optimistic, but we do need to show faith in ourselves and to let others feel that we make the most of the encouraging factors in the situation. Without an attitude of this kind we would fail to take full advantage of the opportunities which undoubtedly lie just ahead of us.

"The society, of course, is devoting its energy to the development of the electrical industry and, except that its members recognize the general feeling and the desirability of conservatism until the future is a little surer, it has not been affected by the war. We recognize the necessity of extending business in every possible direct and indirect way and at this time are especially interested in development work. With that object in view we are doing all we can to help central stations to increase their load. This policy will reduce the burden of overhead expenses, which central stations are more likely to feel in these times than in generally prosperous seasons, and will do a great deal to increase their business for the future years."

OPPORTUNITIES BROUGHT BY WAR

Secretary Redfield and Others Tell Washington Engineers of Trade Stimulation and of Prosperity in Sight

The Washington Society of Engineers held its annual dinner at Rauscher's in Washington on Nov. 19, with Mr. William Bowie, the president, as toastmaster and with a number of prominent men as speakers. Among these were Secretary William C. Redfield of the Department of Commerce; Mr. Winthrop More Daniels, a member of the Interstate Commerce Commission; Dr. Henry Sturgis Drinker, president of Lehigh University; Dr. Bailey Willis, consulting geologist to the Argentine government, and Mr. Marshall O. Leighton, consulting engineer, of Washington, D. C.

Mr. Leighton, who described the effect of the war upon the American engineer, declared that the war has postponed advancement.

Mr. Daniels said in part: "It is interesting to note that in its evolution from the status of an exceptional employment to that of a recognized profession engineering has been forced, little by little, to take account of other laws and forces than those of mathematics and physical science. Primarily designed to effect certain well-defined technological results, it has increasingly had to take account of economic and social considerations, of the fluctuation of prices and price levels, and of varying rates of pecuniary return. Besides mathematics, it has had to study markets; besides excavation, it has had to study sanitation; besides strength of materials, it has had to study strength of motives to save and invest; and thus eventually engineering has been forced to embrace within its horizon the age-long problem of the Sphinx—the ascertainment and the quantitative appraisal of matters relating to justice and equity between man and man."

Dr. Drinker spoke on "Public Service Movements in Our Universities and Colleges," telling particularly of the growth of the movement for the conservation of natural resources. Dr. Willis told of the opportunity of the American engineer in South America.

Mr. Redfield said in part:

"Economy lies always in wise expenditure. It is not what is spent but what is gained for what is spent that tests economy. He who deals penuriously in engineering costs suffers through engineering laws as well as the laws of nature.

"The United States has mobilized its wealth and property for the protection of its people during the European war. There are three points in the crisis of the world to-day as inexorable as the laws of nature with which you deal—first, the shock, then stimulation, and finally readjustment. The period of shock we have happily passed. We are entering the period of stimulation with the utmost optimism. The period of readjustment will pass readily or with difficulty as we keep our heads during the two preceding periods.

"Trade is now stimulated. An army in the field is five or six times as heavy a consumer as the same number of men in times of peace. The shock had for us a peculiar significance. In all previous great financial crises since we became a great fiscal power we have been able to call on the other world powers for assistance. The war cut off such aid. Further, we are a debtor people. There are thousands of millions of foreign money invested here. Hardly a great railroad is not owned or controlled by foreign capital. Not only were we forced to bear the shock of outside aid being cut off but we were met by demands from other countries to pay. That is a financial crisis that the United States has met and happily passed which the general public reckoned little of.

"South America is craving American trade. With the exception of Italy we are the only great industrial country, and we are the only great financial country that is in a position to engage in this trade. For the engineer there is a wide-open door of opportunity to carry in American enterprise. It is a great opportunity for your constructive enterprise. It brings to your profession a field hardly opened to it before."

THE CLEVELAND MUNICIPAL PLANT

History of the Ohio City's Competition with the Local Illuminating Company and Its Efforts to Establish a 3-Cent Rate for Electrical Energy

Partial operation of the new Cleveland municipal central station in competition with the Cleveland Electric Illuminating Company has been started. This plant is the outgrowth of a small system which the city has operated since 1906. The city has had three small plants without physical connection, each operating in a restricted area. The new plant is to take the place of these.

The fact that the city can thus engage in direct competition with the company without conflict with the Ohio regulative law is due to the unusual absence of a clause in the law preventing such duplication of facilities. Unlike many public service commission laws, the Ohio law does not give the commission the right to prevent duplication of a company service by a municipality. It does not protect an existing company against such competition or a community from the loss which occurs to it by reason of the waste occasioned by the duplication of plants.

The beginning of the Cleveland municipal system in 1906 arose from the annexation of the suburb of South Brooklyn, which had built a plant from the proceeds of an issue of $30,000 in bonds. This plant has been enlarged until at present it represents a value of around $400,000. To the original investment, according to the city, over $101,000 has been added from taxes and over $219,000 from the general fund. In a similar way the city acquired a small plant when the village of Collinwood was annexed. Forty thousand dollars of village bonds had been issued to establish this plant. Of these bonds $18,000 are due on Jan. 1, 1915. An ordinance is now pending in the City Council for the renewal of these bonds, although the generating plant is about to be abandoned. The remaining $22,000 bonds fall due in 1916. There has also been electrical equipment in the Division Street plant of the city water-works department. Water department funds to the amount of $35,000 were used to install it about two years ago. It is now being dismantled. The value of the three plants is estimated by city officials at present to be about $500,000.

The amount available for the new plant was $2,500,000, so that the total city investment as now contemplated by officials will be $3,000,000. According to present plans, the three old generating stations are to be abandoned and scrapped as soon as the necessary connecting lines to the new generating station are completed. During the eight years the city has been engaged in the electric-lighting business it has collected exactly the same rate for street lamps as is paid to the private company, and prior to May 1 of the current year its rates for residence lighting averaged about the same as the rates of the private company. It has not, however, set aside any depreciation fund out of earnings, so that the scrapping of these generating stations will probably result in a complete loss to the taxpayers of the investment represented by the scrapped machinery. If to this be added lost interest on the

whole investment, lost taxes and depreciation on the distribution system, the equivalent of the entire original investment derived from taxation and bond issues has been lost.

Of the $2,500,000, $500,000 represents the proceeds of bonds which the city authorities were able legally to issue without a referendum. The $2,000,000 bonds were approved specifically by voters. Of the $2,000,000 bond issue the actual disbursements on July 1, 1914, were $998,340; the amount of cash on hand unspent was $1,001,669; the total amount spent, including commitments for outstanding contracts on which payment had not been made, was $1,319,859. Obligations to the water department for property transferred and cash advances of perhaps $250,000 are not, it is believed, in these figures. Compared with these figures the investment in the property of the Illuminating company is stated officially to be about $17,500,000.

Comparison of the Systems

A comparison of the capacity of the systems will be interesting. The municipal plant has installed three Allis-Chalmers steam turbines of a normal rating of 5000 kw, a maximum continuous rating of 6250 kw and a maximum rating for two hours of 7500 kw. The Illuminating company has in operation at its two stations at present units with a maximum rating of 98,000 kw. There are now being installed units with an additional rating of 20,000 kw, making 118,000 kw. The additional machinery installed this year is the same in rating as that which was added last year, the normal growth of business having warranted these additions.

The capacity of the municipal plant is based, of course, not on business that it has but on that which it hopes to get by invading the Illuminating company field. The load on the new station was stated by city officials on Aug. 5 as 2400 kw. To this should be added the load, approximately 400 kw, in the Brooklyn plant, which is to be transferred to the larger station, and also the load of the Collinwood plant.

It was stated by city officials that probably 1000 kw would be added to this load within the next two weeks after Aug. 5, but no figures subsequent to those stated have been received. From these data it is evident that the business thus far connected is far short of the plant capacity. There is no fair basis for comparison of earnings of the Illuminating company and the municipal system under present changed conditions, but figures of the last year reveal the differences under the old conditions. In 1913 gross revenues of the Illuminating company were $4,008,776. The revenue from energy sales by the Brooklyn plant was $185,699. Gross revenue of the Collinwood plant in 1912, the last available figure, was $35,496. This indicates a total revenue of roughly $225,000. Owing to the reduction in municipal rates the revenue per unit in future will be less. As the new plant did not begin even partial operation until late in the summer and started then with only a small load, it is scarcely likely that the 1914 report can show a large or material total increase.

Electric Railway Fares and Energy Rates

Other elements enter into the history of the Cleveland experiment. When Tom L. Johnson was Mayor the city was threatening and hostile. Three-cent electric railway fare was then the political issue. The 3-cent electric railway fare was made possible mainly by a forced valuation which compelled a reduction of 45 per cent in the outstanding Cleveland Railway capital stock. Strangely enough, shortly after the long discussed 3-cent municipal-light plant started partial operation the electric-railway fare was advanced to 3 cents cash fare plus 1 cent for a transfer. This makes the cash fare for passengers who use transfers 4 cents.

The analogy and easy progress from 3-cent electric railway fares to 3-cent energy for lighting attracts the attention of observers of Cleveland affairs. There is a general belief that this analogy had something to do with the rate and the slogan adopted in the campaign against the Illuminating company. Strengh is given to this idea by the popularity of 3 cents as a unit in Cleveland. The city is in other 3-cent enterprises. One example is the operation of 3-cent municipal dance halls in the public parks and another is the operation of municipal refreshment stands in the public parks at which 3-cent as well as 5-cent portions of ice-cream, lemonade, milk and buttermilk were sold in summer. It is stated on behalf of the city, however, that the sales of 3-cent portions at the municipal refreshment stands are small.

The statement that the analogy between the figures was mainly responsible for the selection of 3 cents as a unit selling price for electrical energy is not confirmed by city officials. They explain that they had estimates from engineers that energy could be produced and sold for less than 3 cents, but that to be on the safe side they made the maximum rate 3 cents. It is not pretended by anyone that the electrical situation has not been in politics. It was there in the time of Mayor Johnson, although in the years of his rule lighting was subordinated to the electric railway. During the administration of Mayor Baker the question of the municipal plant has been a leading one.

If nothing else had done so, the fact that the proposed issue of $2,000,000 bonds had to be voted on would have made the issue political. In the last mayoralty campaign much agitation took place over the bond proposal. Directors of the Chamber of Commerce of Cleveland objected to the proposal on the following grounds: "Because the Legislature has created a public utilities commission; because other municipal projects requiring the issue of bonds demand commencement or completion; because the municipal ownership of public utilities under the present political conditions, with the civil service law in operation less than two years and partisanship and the spoils system still dominant factors to be reckoned with in municipal government, is an experiment involving greater public dangers than advantages." After the voters authorized the bond issue on Nov. 7, 1912, the city administration went ahead. The legality of the bonds was contested but was upheld by the Ohio Supreme Court. Other steps were taken in court by taxpayers who claimed that the city sinking fund commissioners were disposing of bonds in their keeping at less than par in order to buy municipal light bonds at par and thus hasten construction of the plant. This charge was disproved in court.

After the bonds had been declared legal they were bought by a syndicate composed of Hayden, Miller & Company of Cleveland, Rhoades & Company of New York and Merrill, Oldham & Company of Boston. They have been marketed principally outside of Cleveland as the interest rate is not enough for local investors. They are secured by the credit of the city.

The city selected a site in the East Side factory district on the shore of Lake Erie. It used ground belonging to the water department. City officials state that the appraised value of this ground, about $141,000, will be paid to that department by the light department, but, according to the information available, this had not been done when this article was written. Construction of the plant proceeded slowly, and it was somemonths after the early promises of completion before it was ready for even partial operation. When it was believed that the plant would be in early operation the City Council passed an ordinance making the maxi-

mum rate of private companies 3 cents per kw-hr. This ordinance, if effective, would place the companies on the same maximum revenue basis as the municipal plant. Two small companies operate independently in limited areas in the city, and they, as well as the Illuminating company, were subject to this legislation. After introduction of the ordinance, Mr. S. C. D. John, secretary of the Illuminating company, wrote a protest to the Council. He said in part:

Contention of the Company

"Twenty years ago the company started business in Cleveland. During this period it has been the company's policy to reduce rates for service as rapidly as the reducton in costs and improvement in the electrical art would permit and still enable it to maintain a high standard for excellence of service to the whole community. An inferior service in a restricted territory could doubtless have been rendered at a less cost, but we have considered it an obligation to serve the entire community with the best service obtainable.

"In pursuance of this policy rates for electric service in the home have been reduced by the company from 12½ cents in 1897 to an average rate of less than 6½ cents for all electricity used in residences for the year 1913. The cost to the city of a street arc lamp in 1897 was $94.80 per year. The price to the city for the year 1914 is $49.80 per lamp.

"These reductions have been made gradually, from time to time, and have been made by the company voluntarily. In addition to this substantial reduction in the cost per unit, there has been a further reduction brought about by the greatly increased efficiency of incandescent lamps, so that to-day the consumer obtains as much light for 3 cents as he could get in 1897 for 12½ cents. In other words, the consumer obtains four times as much light to-day as he did in 1897 for the same amount of money. In this same period the general cost of living has advanced from 40 to 60 per cent.

"In comparison with this record the rate of 40 cents per 1000 cu. ft. charged for water by the water-works—owned by the public and operated by the city—has not changed during the entire period.

"The company's policy regarding extensions has been liberal. It has run lines wherever there has been a reasonable demand for service, and this has meant in many cases an investment producing but a meager return thereon. A less liberal policy on the part of public service companies tends to congestion of population and consequent unhealthful conditions because it inevitably retards the development of residence growth into outlying districts.

"The company has always considered that its welfare is bound up with the interest of the entire community and, so believing, it has endeavored to so shape its policy as to retain the good will of the people whom it serves as well as to promote the industrial business life of the city.

"The company recognizes that it is a most natural desire for the users of its service, as well as those who may expect to become users of its service, to secure such service at the lowest possible cost to themselves; but we are confident in the belief that they neither desire nor would they approve of the enforcement of unjust conditions to bring about such a result.

"Since the company began business in Cleveland it has anticipated the necessity for compulsory regulation by voluntarily reducing rates whenever possible. The city, however, has seen fit to enter this field as a competitor and otherwise to impose onerous conditions of operation, with which conditions—for its own plant—it has not deemed it necessary to comply. The city has gone into competition with the company but has denied to the company the privilege of competing in the territory occupied exclusively by the city. We submit that a rate which would be reasonable when this company had the entire field may easily prove to be insufficient when the possible loss of business, added to the expenses of securing business and additional business risk incident to competition, are considered.

"The pending rate ordinance, we believe, is unfair and unjust. The maximum rate imposed is based on neither the logic of reason nor any recognized principles of rate-making. The mere fact that 3 cents has been adopted as being the proper rate for a street-car ride makes it no measure of the value of a unit of electricity any more than it makes it the measure for the price of a sandwich or a glass of beer.

"Entirely aside from the foregoing considerations, we submit that the whole principle of public regulation of public service companies rests on the principle of exact justice, first to the public who are users of the service, and next to the person or company that furnishes the service. Public regulation of utilities is a judicial rather than a legislative function, and only an impartial tribunal can act disinterestedly. The city, by itself electing to compete for the electrical business of Cleveland, has placed itself in a position where it must of necessity be a prejudiced judge when it undertakes to regulate the terms upon which its competitors may do business.

"For the city to engage in any business and at the same time exercise the functions of prescribing rates and conditions of operation for its competitor is so obviously unfair that it needs no further comment."

Valuation Under Way

Nevertheless, the Council passed the ordinance. The companies concerned then appealed to the Public Service Commission of Ohio, with which the maximum rate issue now rests. The city has authority to make rates, but if rates are made that imperil the return on the property, a company has the right of appeal to the commission. A valuation is now under way.

It is a notable fact that even in those quarters of the city administration which appear to be most hostile to the company the company service is admitted to be excellent. In fact, there is in the city hall and among city officials generally a pride that is not repressed and a belief that the lighting and motor service found in Cleveland is far superior to that of most other cities. The city officials, however, do object to the company rates. It is the belief of observers that the testimony of city officials as to the excellent character of company service represents the attitude of the city generally.

Voluntarily the company has made steady reduction in rates. Until the last ordinance was passed no regulating ordinances had been enacted by the city in twenty years. Prior to 1893 an incandescent-lighting flat rate was used without meters. In 1893 the city passed an ordinance fixing a maximum rate of 12½ cents per kw-hr. In 1896 the Illuminating company adopted the two-rate system, 12½ cents per kw-hr. for sixty hours' use of rating in any month and 5 cents for all energy used in excess of sixty hours' use of rating. In 1901 the company reduced rates by requiring only fifty hours' use of rating. In 1905 a further reduction was made to forty hours' use of rating. In 1906 a reduction was made to 30 hours' use of rating. In 1911 the maximum charge was reduced to 10 cents per kw-hr. for the first thirty-six hours' use of rating and 5 cents for all in excess of thirty-six hours in any month. The changes in rates since 1896 are shown in the accompanying table. The reduction in the city arc rate from 1896 to Jan. 1, 1906, when the city acquired the Brooklyn plant, was 22.4 per cent; from Jan. 1, 1906, to the pres-

ent it was 32.3 per cent. The reduction in the average rate for motor service from 1899 to Jan. 1, 1906, was 16 per cent; from Jan. 1, 1906, to the present it was 39 per cent.

To take charge of the design and construction of the new city plant as well as the management of the city lighting business Mr. F. W. Ballard was selected. Mr. Ballard began his service on Feb. 1, 1912, before the public approved of the $2,000,000 bonds. He had been chief constructing and consulting engineer of the Sherwin-Williams Company. Mr. A. B. du Pont was appointed consulting engineer.

TABLE SHOWING CHANGES IN COMPANY RATES SINCE 1896

	City Arc Rates	Residence	Motor Service, Cents per Kw-hr.
1896	$94.80	12½ cents per kw-hr.	*
1897	93.24		*
1898	93.24	Aug., 12½—5 cents (60 hours)	*
1899	89.88		4.882
1900	87.60		4.616
1901	82.92	Jan., 12½—5 cents (50 hours)	4.556
1902	82.92		4.302
1903	75.00		4.333
1904	75.00		4.426
1905	73.56	May, 12½—5 cents (40 hours)	4.097
1906	69.72	June, 12½—5 cents (30 hours)	3.456
1907	67.92		3.050
1908	54.96		3.112
1909	54.96		2.644
1910	54.96		2.502
1911	53.88	June, 10 —5 cents (36 hours)	2.489
1912	51.96		2.521
1913	49.80		2.498

*Motor service consumption not carried separately prior to 1899.

Statement of Mr. du Pont

Mr. A. B. du Pont, who acted as consulting engineer in the construction of the plant and resigned upon the substantial completion of the structure, expressed the following opinion to a representative of the *Electrical World*: "As to the question of results of operation of the new plant I do not know. It starts with an advantage over the private plant in two particulars. In the first place, the cost in proportion to capacity is relatively low compared with what private plants heretofore have cost; its efficiency in so far as design is concerned is at least equal. In the second place, the rate of interest that the city will be required to pay on the cost is less than 4½ per cent, whereas private capital in the past has been forced to pay and is paying anywhere from 6 to 20 per cent. If the new municipal plant can have any disadvantage compared with the private plant, it must be in the cost of labor and material involved in the production of energy and in the maintenance of the plant. Time alone can tell to what extent the money expended in operation and maintenance of the plant will tend to destroy the advantages already mentioned. The civil service rules of the city might hamper the operation of the plant a little."

Statement of Mr. Ballard

Mr. Ballard stated to the *Electrical World* that the plant will have three 7500-kw maximum-rating Allis-Chalmers steam turbines, which have been purchased new, and one 1500-kw Westinghouse steam turbine, which will be transferred from the Brooklyn plant. There will be installed six 1000-hp special-type double-fire Sterling boilers similar in design to those in the Detroit Edison Company plant. These boilers will be equipped with Taylor stokers capable of operating at 300 per cent rating. There will be installed a Green economizer with 27,000 sq. ft. of heating surface. A steam pressure of 250 lb. will be carried on the boilers and 150 deg. Fahr. superheat. Current will be generated at 11,000 volts which will be used for underground distribution for substations to be constructed in various parts of the city. The station will be used for all purposes for which central stations are generally operated. A large part of the street lighting for the city will be done by the station, and in addition the general business of residence and other lighting as well as a general motor-service load will be put on the plant. Mr. Ballard will read a paper on the plant before the American Society of Mechanical Engineers.

The general conclusion to be drawn from a study of the situation in Cleveland is that the city has invested in the plant without any more knowledge or promise of what it can do than might be had by a similar private competitive plant. It has equipped a huge plant for the generation of electrical energy on a large scale. Beyond that point it has had no experience to guide it except on the small scale permitted by its earlier plants. Problems of transmission and sale of the service and energy are almost wholly before the city. Whether or not it will be able to solve those problems cannot be foretold at this time. Upon the answer the success of the experiment rests.

The plant has been erected in a factory district in order that if possible it may build up a large motor-service load. Criticisms that no effort is being made to extend 3-cent service to the residence districts, which comprise, of course, the centers of largest population, are answered by city officials by the statement that it is necessary for them to get first a large motor-service load. Then, they say, they can accommodate the residence load at 3 cents.

The city has made an enormous investment in a monumental experiment. It has not hesitated to set itself in competition against the company in every possible way. It is openly soliciting company business. It is sending solicitors to company motor-service customers and offering them lower rates. It has a new-business organization at the head of which is a former employee of the Illuminating company. It has, however, no such valuable organization as the company has developed. It cannot offer, and has evidently made no effort to offer, the valuable engineering service to patrons which is a feature of the company organization. It does not go into a plant and suggest and criticise as does the company organization. It has no one to give service of that kind. Its motor-service rates run as low as 1 cent per kw-hr. The company rates, so far as its largest customers are concerned, are lower. The contract of the Illuminating company with the Cleveland Railway provides for payment in accordance with consumption, and at present this rate is 7 mills per kw-hr.

Everything indicates that the city officials fully realize the uncertain situation in which they stand at the present time. They have not made a success of the municipal venture, but they have not yet gone far enough with it to enable fair judgment to be passed on their ability to manage it. No matter how low a rate they reach on their production of energy, large and serious costs will arise in transmission and sale. With these costs they have not yet gone far enough to learn the effect on operation. It is clear that some time will have to elapse before the municipal plant can get a reasonable load approximating its capacity. This may require one year. It may take two years, three years or even more. The longer it takes, the heavier is the burden of capital cost which is part of the fair cost of the plant. Until a load approximating the maximum rating is obtained the cost of operation and maintenance will, of course, be far above the minimum desired.

Officials of the company express great confidence in the character of their service and in the economy of their capital, operation and maintenance charges.

PUBLIC SERVICE COMMISSION NEWS

District of Columbia Commission

The commission has notified the Potomac Electric Power Company that it has declared void four contracts with Washington consumers which antedated the Public Utilities Commission act. The commission announced that it would send notices to this effect to the company and the consumers with a statement that if the contracts were not canceled by a given date both company and consumers will be deemed liable to fines as provided in the act for not observing regulations of the commission.

Idaho Commission

Mr. W. D. Standrod, of Pocatello, has resigned as a member of the Idaho Public Utilities Commission on account of personal reasons.

The Public Utilities Commission has rendered decisions reaffirming its determination not to grant certificates of public necessity and convenience to companies to enter a field which is being adequately served by the existing company. The decisions had reference to the application of the Idaho Power & Light Company and Clear Lake Power & Improvement Company to enter the field supplied by the Great Shoshone & Twin Falls Water Power Company in the counties of Twin Falls, Gooding and Lincoln.

Indiana Commission

Attorney-General Thomas M. Honan has given an opinion to Mr. Charles J. Murphy, of the Public Service Commission of Indiana, holding that the war-tax bill passed recently by Congress does not affect in any way the relationship between the commission and the utilities. Mr. Murphy had submitted to Mr. Honan the provision of the war-tax measure for the payment of a 1-cent tax on telephone or telegraph messages. Mr. Honan declared that the war-tax measure is one that is to be handled only between the utilities and the federal government and that it cannot in any way affect state laws regulating utilities.

New York Commissions

The last argument in the long-pending Westchester Lighting Company cases was presented before the Second District Commission on Nov. 10 by Mr. Charles F. Mathewson for the company and Mr. Joseph S. Woods for the complainants.

Mr. Mathewson argued that the rate of $1.50 for gas in the complaining villages of Westchester County was not excessive inasmuch as the record proved that the return to the company on its investment at these rates was but a little over 4 per cent. He said that where the units to be served were scattered over a large territory, as they are in the Westchester villages, the larger investment required and the greater expense of distribution made unfair any comparison with the rates for gas in more densely settled communities. Mr. Mathewson described the territory served by his company as unique in that it consisted largely of small units scattered through a rocky, hilly countryside yet so close to the city of New York and growing so rapidly that constant improvements and extensions were demanded along with a constant demand for service of the highest class.

Mr. Woods told of the action of the New Jersey commission, which he said had established an almost universal 90-cent rate for gas in suburban territory.

Mr. Robert A. Carter, secretary of the Westchester company and vice-president of the Consolidated Gas Company, which controls the former concern, testified that a reduction in rates would seriously cripple the Westchester company.

Current News Notes

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA.—The 1915 convention of the Independent Telephone Association of American will be held at the Hotel Radisson, Minneapolis, Minn., Jan. 19, 10 and 21. Mr. W. S. Vivian, 19 South LaSalle Street, Chicago, is secretary.

* * *

WISCONSIN ELECTRICAL CONTRACTORS.—The twelfth annual meeting of the Electrical Contractors' Association of Wisconsin will be held at Milwaukee Jan. 18, 19 and 20. There will be several business sessions, an all-day open session and a dinner. Mr. Albert Petermann, 626 Lloyd Street, Milwaukee, is secretary.

* * *

ENGINEERS' SOCIETY OF MILWAUKEE.—At the meeting of the Milwaukee section of the national engineering societies held at the Plankinton Hotel, Milwaukee, Nov. 20, Mr. Arthur J. Sweet, illuminating engineer with Vaughn, Meyer & Sweet, Milwaukee, gave a short talk on "Street Lighting Problems: Units, Poles and Systems."

* * *

OFFICIALS OF NATIONAL ASSOCIATION OF RAILWAY COMMISSIONERS.—At the annual meeting of the National Association of Railway Commissioners, held in Washington, D. C., Nov. 17 to 20, the following officers were elected for the ensuing year: President, Mr. Clifford Thorne, of Iowa; first vice-president, Mr. Robert R. Prentiss, of Virginia; second vice-president, Mr. Max Thelan, of California; secretary, Mr. William H. Connolly, Washington, D. C.; assistant secretary, Mr. James B. Walker, of the New York Public Service Commission, First District.

* * *

MEETING OF NATIONAL CIVIC FEDERATION.—Part of the program of the annual meeting of the National Civic Federation, to be held at the Hotel Astor, New York, on Dec. 4 and 5, will be devoted to the subject of public ownership. Prof. J. W. Jenks will review tendencies toward the substitution of governmental action for private enterprise. Ex-Governor Stubbs of Kansas and ex-Senator Jonathan Bourne of Oregon will open the discussion on the question "Shall the Government Own and Operate the Railroads, Telegraph and Telephone Systems and Municipal Utilities?" Congressman David J. Lewis, Dr. Frederick C. Howe and others will speak.

* * *

WASHINGTON SECTION, E. V. A.—The first regular monthly meeting of the Washington Section of the Electric Vehicle Association of America for the season 1914-1915 was held in the offices of the Potomac Electric Power Company on Nov. 12. Mr. F. T. Kalas, of the Electric Storage Battery Company, gave a talk on the trip which he conducted from Washington, D. C., to Philadelphia and return in electric vehicles, and a representative of the B. F. Goodrich Tire Company gave an illustrated lecture on the methods employed in its factory in the manufacture of cord automobile tires. The results of the tests made by the Goodrich company show that 35 per cent more mileage can be obtained per gallon of gasoline when cord tires are used than can be obtained when fabric tires are used. Mr. Marlow, chairman, in outlining the policy of the association for the season, said that at the future meetings of the association papers would be presented which would deal with all phases of the electric-vehicle industry and would not be limited to technical and shop-practice subjects.

Hydroelectric Development on Bishop Creek, Cal.—VII

Transmission system of the Nevada-California Power Company—Details of construction of the lines in service—The stations at Palmetto, Silver Peak and Alkali. By C. O. Poole

EARLY in February, 1905, the writer, in company with one of his assistants, surveyed the preliminary location of the transmission line across the barren waste of desert country lying between Goldfield, Nev., and Bishop Creek, Cal., a distance of over 100 miles. Aside from the little, almost deserted mining camp of Silver Peak and one or two ranch houses, the country was devoid of habitation, and in some places water was 30 miles away. In order to fill contracts in the then new mining camps of Goldfield and Tonopah, it was necessary to have the line, substations, distributing systems and generating station constructed and in service by September of that year. Specifications were drawn and all material and apparatus ordered from the preliminary surveys. The first line constructed had an aluminum No. 0 seven-strand conductor extending from the power house to the Alkali switch station and from Alkali to Tonopah, a total distance of 118 miles. From Alkali to Goldfield, a distance of 10 miles, the conductor is No. 2 strand aluminum. By referring to the map (Fig. 61) a good idea of the territory covered can be had.

In 1908 a second line was constructed consisting of No. 00 seven-strand copper extending from the power houses to Palmetto switch station and No. 0 seven-strand copper extending to Tonopah by way of Silver Peak and Miller's. In 1910 a line was constructed from Miller's to Manhattan, a distance of 38 miles. This line is of No. 0 seven-strand aluminum. The poles are 8-in. top, 35-ft. cedars, except at road crossings, where they are larger to give proper clearance. They are spaced seventeen to the mile. The separation on the equilateral triangle is 72 in. Oregon pine cross-arms, 5¾ in. by 5¾ in., are used, with a special steel pin and support on top of the poles. Fig. 57 shows the design of the pole tops. The two lines where they parallel each other are placed 100 ft. apart and a telephone line is placed between the two main lines. The telephone circuit consists of two No. 9 B. U. G. wires, and the poles are spaced seventeen to the mile, the same as on the transmission lines. The telephone line gives very good service.

A main branch and telephone line extends from the Palmetto switch station to Rhyolite, another mining camp, a distance of 72 miles. This line is of No. 0 seven-strand copper, and 8-in.-top, 35-ft. poles are used, spaced seventeen to the mile. This branch was constructed in 1908. The insulators used on all the lines are No. 351 Locke, 14 in. in diameter, or their equivalent. The insulator pins are made of 2-in. gas pipe swaged down to 2¼-in. outside diameter, where they

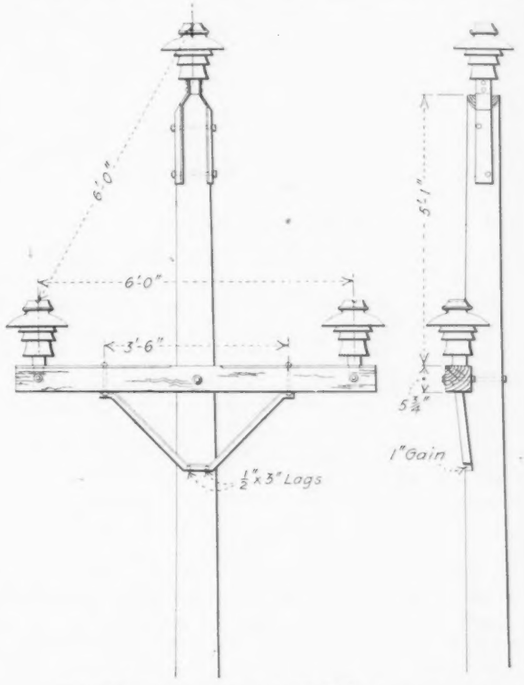


FIG 57—POLE TOP OF 55,000-VOLT LINES

enter the cross-arm and reduced to ⅞-in. diameter at the top, where a thread molded of antimonial lead is fitted to the insulator. Some of the poles are showing decay, as they were not treated, and a number of them are now being stubbed.

The two trunk lines leave the switch house at plant No. 4 and cross Owens River Valley, a distance of 12

FIG. 56—SWITCHING STATION AT PALMETTO

FIG. 58—SUBSTATION AT SILVER PEAK

miles. They then enter a canyon of the White Mountain range, where they reach an elevation of 10,500 ft. On this summit during the first winter's operation a heavy sleet storm occurred, accompanied by a severe wind storm. The aluminum line (the only one constructed at that time) was sleeted to a thickness of 5 in. in diameter. One pole top was broken off and the

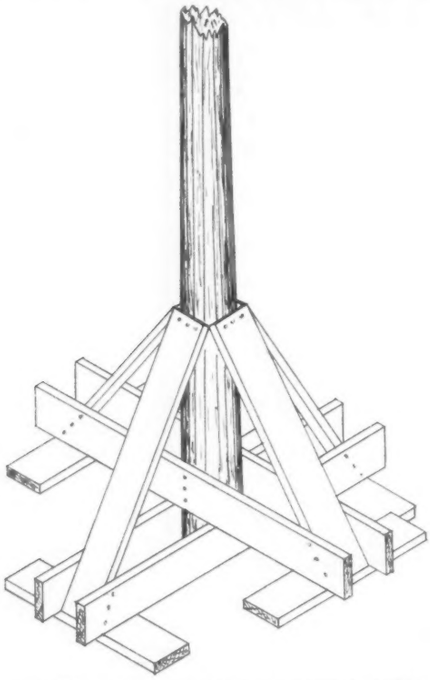


FIG. 59—POLE SUPPORT IN SOFT GROUND

line went to the ground. The line was repaired with extreme difficulty in 6 ft. of soft snow and at zero temperature. The following spring this conductor was replaced with No. 0 copper for a distance of one mile over the summit, and the number of poles was doubled for that distance. The line has not given trouble since. At a point 8 miles on the eastern side of this summit a set of switches is placed in each line for opening in case of trouble, and a line rider's cabin is situated at this point.

After crossing this mountain range Deep Springs Valley is reached. At this point a branch line extends south for a distance of 14 miles to the Loretto copper mine. Then another small range of hills is passed over, after which the lines lead across Fish Lake Valley, then up the gradual slope of the Palmetto Range of mountains, where they enter the Palmetto switch house near the summit of this range. The Palmetto switch house is shown in Fig. 56. It is a steel-frame building covered with corrugated iron. The lines enter the building through disconnecting switches as each line passes through a 55,000-volt Baum oil switch. A paralleling bus connects the line together through a Kelman 55,000-volt oil switch. The lines leave the building through disconnecting switches. The arrangement is such that either section of line east or west can be disconnected from the system, leaving all but the one that may be in trouble still in parallel. From this station the Rhyolite line is taken off through an automatic Kelman oil switch. This line is shown in the illustration. From Palmetto station the lines descend the slope of the mountains to the Silver Peak wash and into the Silver Peak station. Before entering this station the lines pass through Baum open-air-type switches. The two lines pass directly through the station. An oil switch is placed in each line just after it enters the building. There is also an oil switch to parallel the two lines. Each of the lines is provided with a series horn-type lightning arrester with a concrete resistance placed in each leg to ground. There is also a 55,000-volt, three-phase General Electric electrolytic arrester connected to the circuits in a separate building.

From Silver Peak station the two lines branch in different directions, a No. 0 aluminum line going directly east 18 miles to the Alkali switching station and a No. 0 copper line leading north a distance of 30 miles to Miller's substation.

The Silver Peak substation building is of concrete with steel roof trusses. Fig. 58 is a general view of the building and grounds. Comfortable living quarters for the attendant are a part of the building. The station contains three 500-kw Westinghouse self-cooled transformers fitted with water-cooling coils for use in extremely hot weather or in case of overload. The transformers are connected to the line through an oil switch, are wound for 50,000-volt star and have four 2½ per cent taps. The low-voltage winding is delta-connected for 6600 volts.

The Silver Peak substation is located on the shores of a dry salt lake, and the aluminum line crosses this lake for a distance of 4 miles. In sinking the pole holes in this lake, the surface of which is covered with a crust of salt and hard mud, it was found that salt water came within 3 ft. of the surface and that the soil material was too soft to support the pole. In order to make the line safe against the severe winds in that locality, the poles were supported in the manner shown in Fig. 59. After the planks and braces were placed around the poles a huge pile of soil was thrown up around their bases, and by the action of the weather this became one solid mass uniting with the ground. The poles have been in place eight years and are in good condition at the present time.

The Alkali switch station is situated at a spring on the desert, 10 miles from Goldfield and 18 miles from Tonopah, both important mining towns. The main line enters the station and connects to a bus, from which an aluminum line of No. 2 seven-strand wire is taken through a Kelman 55,000-volt automatic oil switch. This line leads to the Goldfield substation. Another line of No. 0 seven-strand aluminum leads to Tonopah, being controlled by a Kelman automatic switch. This branch line is 18 miles in length. Fig. 60 is a general view of the Alkali switch station. There are in this

FIG. 60—SWITCHING STATION AT ALKALI

station three 50-kw 55,000-volt star to 6600-volt delta Stanley transformers, used for supplying energy for operating pumps at the springs, the water being forced 10 miles through a steel pipe to Goldfield. The 55,000-volt incoming line is protected with a set of electrolytic lightning arresters, in a separate sheet-iron building. This point is also a headquarters for line patrolmen.

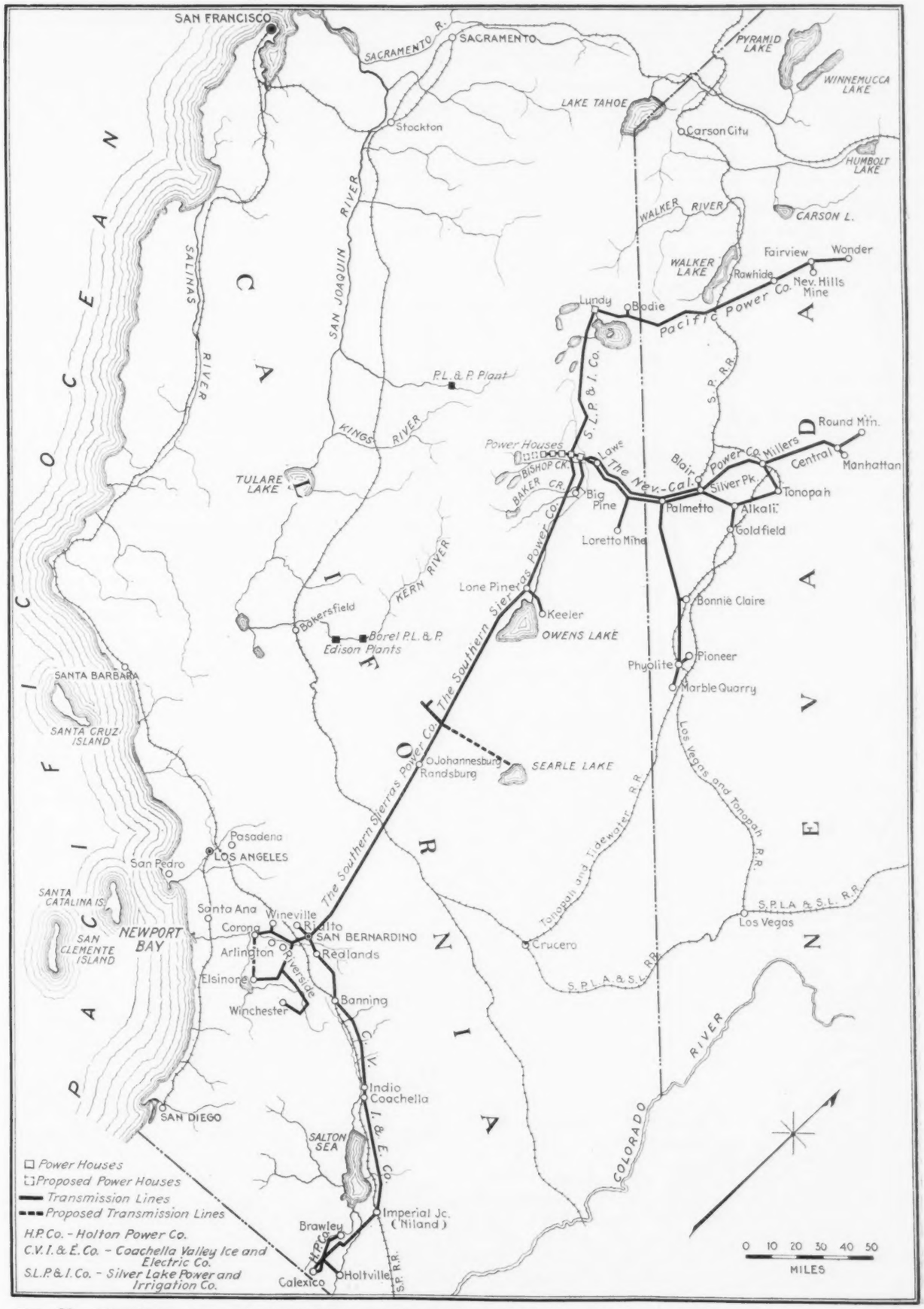


FIG. 61—PROPERTIES AND DEVELOPMENTS OF THE NEVADA-CALIFORNIA POWER COMPANY AND ITS SUBSIDIARIES

Comparison of Radiation Quality of Filaments

Relative emissivities from nitrogen-filled tungsten lamps with helical filaments and from vacuum-type tungsten lamps with straight filaments. By W. W. Coblentz

THE object of the investigation recorded below was to determine whether there is any difference in the shape of the spectral-energy curve of the nitrogen-filled lamp having a spiraled filament as compared with a straight-filament vacuum-type tungsten lamp. The latter lamp was, of course, operated at its normal rating, namely, 1.2 watts per mean horizontal candle. The nitrogen-filled tungsten lamp was operated far below normal, being set to the same emissivity (color match) as the other in the visible spectrum, by means of a spectrophotometer. The spectral-energy curves of these two types of lamps were observed with a vacuum spectrobolometer. The radiation constants were computed by methods previously described.[1] It was found that the spectral energy curves for these two types of lamps superposed very closely throughout the infra-red. The slight lack of coincidence of the two energy curves beyond 2μ (where the absorption of glass becomes marked) could easily be explained by the difference in the thickness and in the kind of glass used in the lamp bulbs. If the quality of the radiations emitted by the spiraled filament had been affected (blackened) by reflections within the helix, then the energy curves on the long wave-length side of the maximum emission would not have coincided.

The method used for setting the two lamps to a color match was somewhat defective in that in the spiraled filament radiations came from within and from the outside of the filament. However, the accuracy attained in setting for color match was much greater than was possible with the arrangement which was tried at that time in order to set the outside surface of the turn of the spiraled filament to the same emissivity as obtained in the straight-filament lamp. To make the experiment more conclusive it was desirable to have the straight and the spiraled filaments of the same kind of wire (the size used in the present experiments was 20-mil wire) in nitrogen-filled bulbs of the same kind and the same thickness of glass.

Through the courtesy of Drs. Whitney and MacKay, of the General Electric Research Laboratory, lamps fulfilling the aforesaid requirements were placed at the writer's disposal for further investigation. The subject was therefore undertaken anew, with improved equipment for calibrating the lamps. The spectral-energy curves were obtained with the vacuum spectrobolometer and fluorite prism as in the previous work.

Method of Calibration

One calibration of these lamps consisted in setting the straight and the spiral filament to a color match, the lamps being at the temperature of normal operation (wave-length of maximum emission $\lambda_{max} = 1.06\mu$). The color-match settings (made by the photometrical division of the Bureau of Standards) were in agreement to from 0.1 volt to 0.2 volt for various observers. This was, of course, practically repeating the previous work, the lamps being at their normal operation.

The most crucial calibation consisted in operating the hairpin filament at its normal temperature ($\lambda_{max} = 1.06\mu$) and adjusting the current in the spiraled filament so that the outside surface of the turn had the same emissivity, the same intrinsic brilliancy, as the straight wire.

The general arrangement for setting the two filaments to the same emissivity is shown in Fig. 1. The nitrogen-filled lamps were placed (one at a time) at *L*. The image of the lamp *L* was viewed by means of a microscope *O*, consisting of a 48-mm focal length objective and a low-power (Zeiss No. 2) eyepiece *E*, the combination giving a magnification of about 20. A higher power gave poor definition owing to imperfections in the glass bulbs. An iris diaphragm, at *I*, was useful in adjusting the focus on and within the spiral. A water-cooled screen was placed at *W*. An image of the filament *L* was brought to focus by means of two triple achromatic telescope objectives *T*, made by Zeiss. Two objectives were used because they are a set belonging to a high light-gathering power (18-cm focal length, 6-cm diameter) spectrometer. They give the best definition by using them in pairs, with the source placed at the principal focus, so that the light is parallel on leaving the first objective and on entering

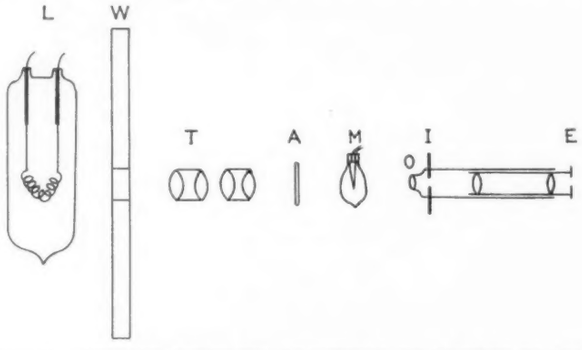


FIG. 1—ARRANGEMENT FOR ADJUSTING FILAMENTS TO THE SAME EMISSIVITY

the second objective. An absorption screen of Schott's black glass was placed at *A*. It was necessary to use some device to reduce the intensity of the nitrogen-filled lamps so that measurements could be made with the comparison lamp *M*, which was a "40-watt" vacuum-type tungsten lamp. The intensity of the nitrogen-filled lamps might have been reduced by means of a rotating sector, or a nitrogen-filled lamp might have been used at *M* if one having homogeneous glass walls had been available. The lamp at *M* served, of course, simply as an intermediary in the substitution method of calibration of the lamps placed at *L*. The glass screen *A* is, of course, slightly selective in its transmission, so that when the image of the filament is viewed through red, green and blue glass at *E* one experiences the same difficulties that are found in any optical pyrometer. This, however, does not interfere with the calibration so long as use is made of the same kind of wire in all the lamps. Of course, one need not attempt to set the lamps to the same emissivity in more

[1] *Bulletin* Bureau of Standards, 5, page 339, 1908.

than one part of the spectrum, say the green. However, it seemed desirable, and it was very interesting, to calibrate the lamps in red, green and blue light. This was a triple check on the accuracy of the calibration, so long as one used the same kind of tungsten wire in the lamps. However, when using a nitrogen-filled lamp containing a more highly polished tungsten wire (lamp No. 3) which had a differently shaped spectral energy curve in the visible spectrum it was not possible to cause the comparison lamp *M* to disappear (in red, green and blue light) against the image of the nitrogen-filled lamp, on the same voltage as obtained in the first-mentioned lamps. Perhaps this matter will appear clearer by citing numerical data. The first step in the calibration is, of course, to set the comparison lamp *M* to the same emissivity (the same intrinsic brilliancy as viewed through the absorption screen *A*) as the hairpin filament (nitrogen-filled lamp No. 1) at *L*. The latter is, of course, operated at some predetermined temperature, giving a maximum emission at, say, $\lambda_{max} = 1.06\mu$. It was found that the comparison lamp *M* disappeared against the hairpin filament when operated on 41.3 (to 41.4) volts when viewed through red glass, on 43.6 (to 43.7) volts when viewed through green glass, and on 45.1 (to 45.2) volts for blue glass. The spiraled filament (lamp No. 2) was then substituted for the hairpin filament at *L*, and its temperature was raised until the comparison lamp on 41.3 volts (red glass) disappeared against the image of the outside surface of a turn in the spiraled filament. It was then found that there was a disappearance of the filament on 43.6 volts (green glass) and 45.1 volts (blue glass), which were the exact voltages for disappearance against the image of the hairpin filament. Making similar settings on the brightest part of the inside surface of a turn in the spiraled filament, the voltage of the comparison lamp had to be raised to 48.6 volts for disappearance in red light and to 52.4 volts in blue light. This showed that some parts of the inner surface of the turn had a higher apparent temperature than the outside surface of a turn of the spiral. In both sets of measurements, on the inside and on the outside surface of the turn, the difference in voltage for disappearance when viewed through red and blue glass is 3.8 volts. If the radiations emanating from the inside surface of a turn in the helix had been seriously modified by internal reflections, thus producing a "blackening" of the radiations, then there would have been a difference in the selective emission, and the difference in voltage for disappearance in red and in blue light would not have been the same (3.8 volts) for the inside and the outside surface of the spiraled filament.

Maintaining the comparison lamp *M* at 41.3 volts (red glass) and raising the temperature of the highly polished spiraled filament (lamp No. 3, placed at *L*) sufficiently to cause the filament of the comparison lamp to disappear against the outside surface of a turn of the helix it was found that the filament did not disappear at 43.6 volts for green glass and 45.1 volts for blue glass as was observed when calibrating the spiraled filament —lamp No. 2. In other words, this filament radiated selectively in comparison with the other filaments, and, as will be shown presently, its selective emission was such as to raise the luminous efficiency.

An Unlooked-for Result

As already mentioned, these lamps had been set to a color match with a Lummer-Brodhun photometer, using lamp No. 1 as a standard. The great surprise was to find that the same currents (to within from 0.01 amp to 0.02 amp) which were required to produce a color match with the hairpin filament were required also to produce the same intrinsic brilliancy on the outside of the spirals. This shows that the composite radiations from the spiraled filament observed in a color match are not markedly different from that of the hairpin filament. The amount of light coming from within the helix is probably from only one-fifth the total area (in each turn) viewed from the side. The spectral energy curves of the straight and the spiraled filament at color match were found in coincidence in the visible spectrum.

A further test, showing that there is no marked difference in the quality of the light emanating from the straight and the spiraled filaments of tungsten in nitrogen was made by sighting upon them with a vacuum-type tungsten lamp, which was operated as an ordinary pyrometer. Of course, the nitrogen-filled lamp had to be operated at a temperature comparable with that attainable in the vacuum-type lamp. It was found that the same current through the hairpin filament caused the filament to disappear against the helix when viewed in red, green and blue light. When sighting within the helix it required, of course, a higher current through the hairpin filament in order to obtain a disappearance indicating an apparently higher temperature. However, the importance of the observation lies in the fact that the quality of the radiation is not sufficiently

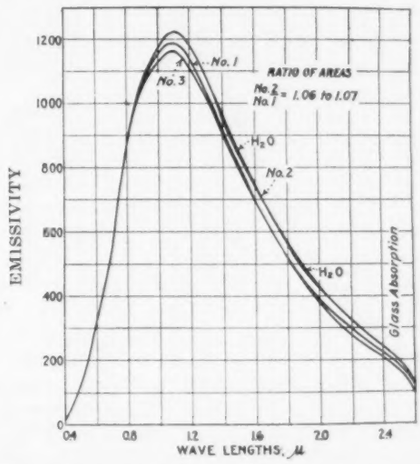


FIG. 2—SPECTRAL-ENERGY DISTRIBUTION OF NITROGEN-FILLED LAMPS 1, 2 AND 3

modified by a black-body effect to require different currents in the hairpin-filament lamp in order to cause the filament to disappear in red, green and blue light when sighting within the helix. If the quality of the light had been appreciably modified within the helix, then raising the temperature of the hairpin filament by a definite amount would not have been sufficient to cause disappearance of the filament against the inside surface of the helix in red, green and blue light. A familiar experience is observed in sighting a pyrometer lamp upon a black body. If the filament is selective in emission, then it will require different currents in the lamp to cause the filament to disappear against the black body when viewed through red, green and blue glass. This test is of interest also in showing that, at the lower temperatures at least, the surface condition of the tungsten wire in nitrogen is not appreciably different from that observed on the filament in a vacuum, namely, the hairpin filament.

Of course, it must be admitted that there is some modification ("blackening") of the radiation within the helix as shown in the curves in Fig. 2. However, it remains to be shown whether this is attributable to internal reflection, to crimping of the inside of the filament, or to cracks in the surface.

In Fig. 2 curve No. 1 gives the spectral-energy distribution of the hairpin filament (nitrogen-filled lamp No. 1) operated at its normal temperature. Curve No. 2 gives the spectral-energy distribution of the composite radiations from the spiraled filament (nitrogen-filled lamp No. 2) when the outside surface of a turn is set to the same emissivity as that of the hairpin filament (lamp No. 1). The ratio of the areas is 1.06 to 1.07, showing that the spiraled filament emits about 7 per cent more infra-red energy than does the straight filament. The luminous efficiency of the straight filament is, therefore, about 7 per cent higher than that of the spiraled filament. The "specific consumption" of the spiraled filament is perhaps from 15 to 20 per cent higher than that of the straight filament. This is attributable to the fact that the spiraled filament acts as a very thick, short filament as regards elimination of convection currents. In other words, by sacrificing 7 per cent in the luminous efficiency there is obtained a very marked gain in the total specific consumption of the spiraled filament as the result of elimination of convection currents. If the loss of 6 to 7 per cent which is to some extent black-body radiation can be avoided in the helical filament, then the luminous output (in lumens per watt) will be increased.

This particular filament had numerous scratches—conspicuous as bright streaks (see Fig. 3); perhaps inclusions of graphite having a higher emissivity—on the outside of the turn of the spiral. A deep scratch or crack is a miniature black body, which, as is well known, is the least efficient emitter of luminous

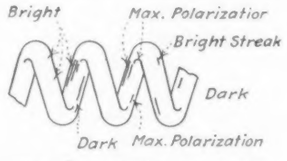


FIG. 3—INSIDE OF HELIX

radiations. Of course, some of the black-body radiation, manifested by an excess of radiation (lack of coincidence) on the long wave-length side of the spectral energy curve (Fig. 2) may be attributable to some extent to a modification of the radiations emanating from within the helix. It would be difficult to attempt to determine spectrobolometrically on one filament how much of the black-body effect is contributed from within the helix. That the amount is small is shown by the behavior of lamp No. 3 (Fig. 2), in which the spiraled wire appeared very smooth and highly polished. Within the helix the surface appeared to be more crimped and mottled than that of lamp No. 2. Nevertheless, the spectral-energy curve (see Fig. 2, curve No. 3) coincides with that of the (straight) hairpin filament, showing that it is possible to avoid the production of deleterious "black-body" radiations by using smooth, highly polished wire which is free from graphite and which is kept free from scratches while winding and mounting. Although operated at a 15 per cent overload, the outside surface remained smooth, but within the helix the surface seemed a little more mottled. The specific consumption of these lamps has not yet been accurately determined. The hairpin filament was operated at close to 0.5 watt per candle, and the spiral filament at considerably lower than 0.5 watt per candle. The great saving (perhaps 20 per cent) in the power input in the spiraled filament is due to elimination of "black-body" radiation and heat losses by convection currents.

This analysis of the radiations from the straight and the helical filaments is very instructive as regards the great difference between the "specific output" and the "luminous efficiency." The latter is the ratio of the "visible" to the total amount of radiation emitted. It affords no idea of the energy that must be expended in order to produce the radiations which are emitted. The hairpin filament and the spiraled filament (No. 3) have practically the same luminous efficiency. Nevertheless, the candles-per-watt output is perhaps from 15 to 20 per cent higher in the spiraled filament owing to the elimination of convection losses. In the same manner, the high "luminous efficiency" of the firefly is deceptive, for we do not know how much power had to be used originally to store up the energy which is expended in a few brief flashes. This statement is based on the assumption that the brief flashes are simply a liberation of energy previously stored. It is in agreement with the observation that after a prolonged period of flashing the ability to continue to flash seems suddenly to come to an end.

It may be that the inner surface of the spiral is hotter than the outside, partly as the result of slow heat conduction from the center of the wire. The inside of the turn is the shorter; it takes the greater current; it has the smaller surface; convection losses are no doubt small, and hence one would expect the inside to be the hotter. However, if the difference in the spectral-energy curves (Fig. 2) were due to a difference in temperature only, then the two energy curves would intersect more symmetrically on the two sides of the maximum emission, instead of intersecting in the violet, as observed. The unsymmetrical energy distribution is to be considered due in part to black-body radiation. Excellent illustrations, as observed in tungsten, tantalum and carbon filaments, have been published elsewhere.[1] The black body is the least efficient radiator to produce a high luminous efficiency. However, the spiraled filament furnishes an example in which it appears profitable to sacrifice 6 per cent in efficiency by producing a black-body effect in order to eliminate some 20 per cent in convection losses.

Value of the Wave-Length

The wave-length of the maximum emission, λ_{max}, was computed by the methods given in previous publications. For the straight hairpin filament (lamp No. 1) the maximum emission occurs at about $\lambda_{max} = 1.06\mu$. For the spiraled filament (lamp No. 2) the value is $\lambda_{max} = 1.07\mu$. For the spiraled filament No. 3, $\lambda_{max} = 1.05\mu$, and at a 15 per cent overload the maximum emission is shifted to 1.01μ. Lamp No. 2 when set to a color match with the straight-filament lamp has its maximum emission at $\lambda_{max} = 1.22\mu$. As explained in the previous paper, this is the minimum value of the computed wave-length.

The inside of the helix (Fig. 3) showed dark streaks which were regularly repeated in successive turns of the spiral. The dark part as seen on the lower outside part of the turn extended well around toward the inside, corresponding to the same part of the wire that appeared bright as viewed across the edge, with the rest of the turn to the rear. From this it is evident that much of the increased brightness within the filament is an optical illusion owing to difficulties in focusing upon the (rear) inside of the turn by sighting across the part of the turn nearest the objective.

An examination was made of the light from within the helix by using a nicol prism in the eyepiece *E* (Fig. 1) of the microscope. As shown in Fig. 3, there are two regions on the inside of the turn which show marked polarization. This, no doubt, is the region of reflection of the light emanating from an adjacent turn. As already stated, the inner surface of the turn

[1] *Bulletin* Bureau of Standards, 5, page 360, 1909.

shows bright and dark streaks which are quite regularly repeated within the successive turns. Using a high-power eyepiece, the whole appears quite uniformly bright owing to poor definition. Much of the brighter appearance within the helix is no doubt an optical illusion. Sighting across the front side of a turn of the spiral upon the inside of the rear of the turn, there is a bright line ("bright" in Fig. 3) on the part of the front turn which elsewhere appears darker. This is attributable partly to the inability to focus on the curved edge. As the focus is changed this bright streak changes in intensity. The whole aspect of the inside of the turn of the spiral is such that the writer is in doubt whether the inside is really much brighter than the outside.

In conclusion, it is not irrelevant to add that in view of the fact that the average "practical" man sometimes asks the question "Of what earthly use is your spectrobolometer anyway?" it is a matter of some gratification to be able to point to the present analysis of the radiations from these tungsten lamps as a specific example of information gained which has a direct bearing upon one of the most vital questions now occupying the attention of experimenters.

THE COOPER HEWITT OSCILLATOR

Preliminary Work on New Developments Involving Improvement of the Vacuum-Type Rectifier Now Completed

As noted on page 988 of the *Electrical World* dated Nov. 21, Dr. Peter Cooper Hewitt has announced completion of the preliminary work on a new development of his well-known mercury-vapor lamps and rectifiers. The new inventions involve improvement of the vacuum-tube rectifier for feeble high-frequency currents such as occur at the receiving station of a radiotelegraph or radiotelephone system and the development of an oscillator or converter which efficiently transforms direct current of low or high voltage into sustained alternating current of any frequency. Although the rectifier is now said to be in such form that it may be used as a radio receiver of sensitiveness considerably greater than that of the most delicate electrolytic detectors, since the incoming energy is not only rectified but amplified, it is the oscillator which Dr. Hewitt believes to be of the greater commercial importance, both in radio signaling and in the transmission of power. At the present time the technical and physical details of the apparatus cannot be disclosed.

During the experimental study of various peculiar phenomena which occasionally accompany the operation of the mercury-arc rectifier Dr. Hewitt encountered nearly a year ago an entirely novel set of conditions. Close investigation of these developed the fact that under certain circumstances the relations between current, voltage and resistance in the vapor conductor were of a kind absolutely outside the limits of his previous experience. Research into these curious effects resulted in the new oscillator, which Dr. Hewitt states is dependent upon electrical principles quite different from any hitherto used.

Not only is the physical basis of the invention a departure from earlier work, but the results already achieved have not previously been obtained through any other instruments. Even in its laboratory form, the oscillator has been found capable of producing, from direct current, sustained alternating currents of any frequency up to 100,000 or more cycles per second. The efficiency of conversion is excellent, and the low internal losses of the apparatus indicate that commercial use in numerous ways will be entirely feasible. In contrast to oscillators which have heretofore been suggested, the device is inherently capable of handling large amounts of power.

A characteristic of the device is that the frequency of oscillation may be varied instantaneously over a wide range of values, which feature should increase the importance of the oscillator in its application to radio transmission. Similarly, the output in power may be altered easily and quickly, and through this property Dr. Hewitt anticipates that the apparatus will find extended use as a generator for radiotelephony. The instrument appears to be extremely rugged and to a large extent self-protective when subjected to potentials much above the normal values used in operating.

Outlook for Commercial Use

Several distinct modes of operation are possible for the oscillator, and at the present time exhaustive researches, including oscillographic studies, are being made into the complicated electrical actions in the circuits of the apparatus. The correlation of these data now being obtained with the results of earlier investigations into gas and vapor conduction phenomena should assist in the rapid growth of the new oscillator into a commercial machine. Dr. Hewitt has expressed the belief that after a reasonable period of development, such as was required to bring the mercury rectifier to its present forms, the oscillator should find extended practical use in many fields besides that of radio signaling.

In the transmission of electric energy by wire over long distances it has been usual to employ high voltages for the purpose of reducing the heat losses in the lines. Although means for generating high-voltage direct current have been available for a number of years, the difficulties of utilizing efficiently such high pressures in continuous current at the receiving end of the line have prevented its widespread adoption. The ease with which the voltage-current ratio of alternating current may be transformed with stationary apparatus has given alternating-current transmission an almost exclusive place in long-distance transmission. This may be very different in the future, Dr. Hewitt points out, since by placing a high-voltage rectifier at the generating end of a line and a high-voltage oscillator at the terminus it will be possible to distribute in useful form the power received and yet to transmit it as direct current over the long lines. Such direct-current transmission would, of course, permit operation under unvarying line conditions, and harmful capacity and induction effects would be so greatly minimized that even for great distances underground transmission might prove practicable.

On the whole, the oscillator gives promise of startling extensions in application to various electrical fields. The invention is a logical outgrowth of Dr. Hewitt's earlier work, since it is an exact inverse of his rectifier and therefore a complementary device.

Battery-Operated Locomotive Headlamps

Battery-operated headlamps are being used with success on the Southern Pacific Railroad. Nitrogen-filled tungsten units rated at 140 cp are mounted in standard oil-lamp reflectors. Each headlamp takes 13 amp at 6 volts and is operated from a 300-amp-hr. lead-cell storage battery which is capable of furnishing energy to the headlamp, the three cab lamps and two "blizzard" lamps for thirteen hours. The cells are carried on the top of the boiler and at the end of each trip are lowered for the purpose of charging, with the assistance of a small crane.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

Vicissitudes of an Electric Automobile

Some time ago a private garage in Indianapolis, containing four gasoline cars and a Waverley electric brougham, was destroyed by fire. The coach body of the electric automobile was burned off and the aluminum battery-box covers were melted, but the battery itself,

TRANSFORMATION OF AN ELECTRIC BROUGHAM

the frame and the chassis were practically uninjured. The gasoline cars were a total loss. The electric car was acquired by a baker, who fitted it with a huge model of a loaf of bread, as shown in the accompanying illustration, and used it for advertising purposes.

Concerning Public Courtesy—"It Pays"

The following expression to its employees on the subject of courtesy to customers and public has been posted by the Central Illinois Public Service Company in its business offices and indicates the attitude of the company on a subject which is of vital importance to its patrons:

"The possession in marked degree of any worthy faculty should always be an incentive to develop that faculty. This company considers that its employees possess the faculty of being courteous to the public above the average. To those who cultivate and exercise this faculty the company extends its congratulations and its thanks. To those who have not fully appreciated its importance thoughtful consideration of the following is suggested:

"First—The principle that underlies courteous treatment of others is simply that of doing unto others as you would they should do unto you.

"Second—In a highly complex and technical business such as that of the public service company there are many things that you, with your training and daily experience, understand with perfect familiarity but which the public does not understand; therefore do not assume that the people should comprehend them without asking questions, but when they make inquiry of you give them the courtesy of a reply just as full and clear as you can make it, and without any suggestion of superiority born of a greater knowledge.

"Third—Words are only one means of expression, and manner is quite as important; therefore, remember that a kindly and gracious manner is not only the sign and mark of a self-respecting man but is to your words what oil is to machinery in making them move effectively to their purpose.

"Fourth—True courtesy is no respecter of persons. It remembers that 'a man's a man for a' that,' and it gives the civil word and the helping hand quite as readily to the ill-clad stranger as to an official of the company.

"Fifth—Courtesy is not only something the public has a right to expect of you, but it pays.

"It pays in the friends it makes you personally and as a representative of the company.

"It pays in minimizing the friction of your life as well as that between the company and its patrons.

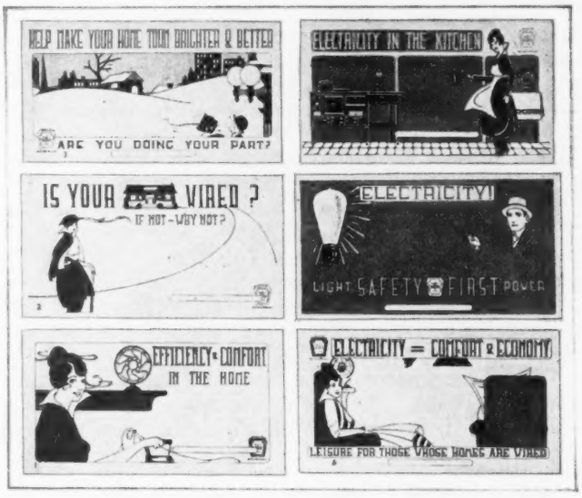
"It pays in raising your standing with the company.

"It pays in the personal satisfaction resulting from having done the right and kindly thing by your 'neighbor.'

"It is the wish of the management of this company that all of its representatives whose work brings them in contact with the public may appreciate and fully measure up to their duty and privilege in this respect."

Attractive Placards for Street-Car Advertising

The Society for Electrical Development, Inc., has prepared a number of attractively colored placards for street-car advertising which are shown herewith. All

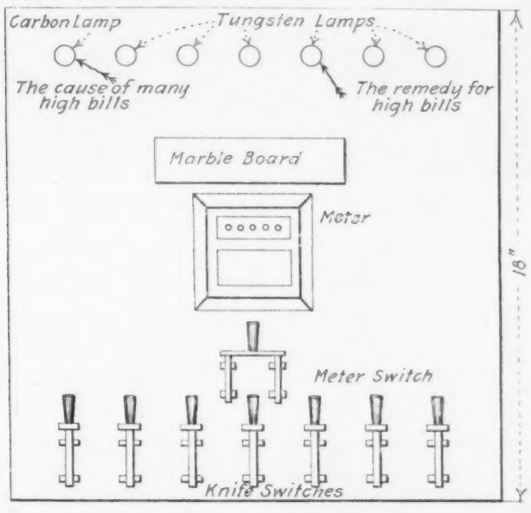

HELP MAKE YOUR HOME TOWN BRIGHTER & BETTER
ARE YOU DOING YOUR PART?
ELECTRICITY IN THE KITCHEN
IS YOUR HOUSE WIRED ?
IF NOT - WHY NOT ?
ELECTRICITY!
LIGHT SAFETY FIRST POWER
EFFICIENCY · COMFORT IN THE HOME
ELECTRICITY = COMFORT & ECONOMY
LEISURE FOR THOSE WHOSE HOUSES ARE WIRED

ELECTRICAL POSTERS FOR STREET CARS

of them are in keeping with the "Do it electrically" propaganda, space, of course, being left for the name of the member company. An appeal is made to the domestic side of life, and the illustrations suggest the comfort and efficiency which are available to those who have their homes wired. The cards are of standard size to fit the advertising space in street cars, trains, etc.

Showing Customers the Cause of High Bills and the Remedy

A marble panel about 18 in. square hangs in the Wichita (Kan.) office of the Kansas Gas & Electric Company, and on the panel are attached several lamps and switches and a watt-hour meter. All of the lamps except one contain tungsten filaments. The exception is



METER BOARD USED TO EDUCATE CUSTOMERS IN THE ECONOMY OF TUNGSTEN LAMPS

a 16-cp carbon-filament lamp, and beneath it is an arrow pointing to the carbon lamp as "the cause of many high bills." At the opposite corner of the panel another arrow points to a medium-sized tungsten lamp as "the remedy for high bills." Knife switches at the base of the board connect each lamp with the meter, and customers are invited to operate the switches and observe the different speeds of the meter disk for themselves.

Old Coffee Pots Bring $1 Each at Springfield, Mo.

The new-business department of the Springfield (Mo.) Gas & Electric Company, under the management of Mr. S. R. Gallagher, has been conducting an electric-percolator campaign along the same lines as those which have proved so successful in selling electric irons. In beginning the campaign the electric company used considerable newspaper advertising, heading the advertisements "Wanted—Every Old Coffee Pot in Springfield." Following this attractive headline was the company's liberal offer. The price on a seven-dollar percolator has been reduced to $5.98, and an additional $1 is allowed if the purchaser brings in an old coffee pot. The company considers the percolator a good revenue producer.

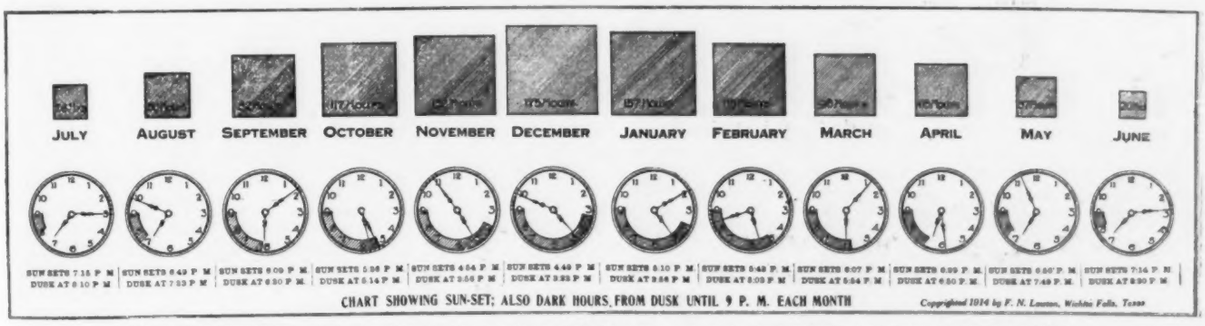
Central-Station Ice-Making in Massachusetts

In connection with a hearing at Boston recently on the proposal to place the ice business under commission regulation, Mr. Charles T. Grout, of Fitchburg, Mass., discussed at length the advantages of central-station ice-making. He said that about 200 central stations are successfully manufacturing ice in various parts of the country on an off-peak basis, and urged the commission to recommend enabling legislation in its forthcoming report in the interests of reducing the cost to the consumer of this necessity of civilization. He stated that the admirable organization, financial strength, and above all the off-peak generating capacity of central stations, peculiarly fitted them to undertake this work. Mr. Grout said that artificial ice is rapidly superseding the natural product, and he emphasized the short duration of the yearly and daily peak loads in relation to the length of time during which that part of the plant investment demanded by them stands idle. In lesser degree there is a large daily unused capacity in plant which could be employed in supplying energy for ice-making, even with a temporary interruption of the freezing process during the extreme peak load. The speaker said that as the bulk of the business comes in summer, it would be of great economic benefit to have the central stations take up the work.

Why Electric Light Bills Grow

Many forms of charts have been devised and used by central-station managers to illustrate to customers the effect of shortening days and advancing twilight in increasing the bills of the electric-light company. Clock dials have been employed with effect by Mr. F. N. Lawton, manager of the Wichita Falls Electric Company, Wichita Falls, Tex., who has had the sketch reproduced herewith protected by copyright. The clock hands show the average time of sunset for each of the twelve months of the year, and the shaded segment of each dial represents the period during which electric light will be required each day from dusk until 9 p. m.

The diagram is also unusual in taking into account —very correctly—the fact that during the summer months dusk follows forty-five or sixty minutes after sunset, owing to the sloping path of the sun beneath the horizon. On the other hand, during the winter months clouds and mists often obstruct the sun's disk so that even long before the sun has sunk below the horizon the illumination in the sky has fallen to a value comparable to that of the summer twilight above referred to. It is this effect, often overlooked, which contributes to the purely astronomical effect of the shortening days. The reverse side of the card, which has been widely distributed by the Texas Power & Light Company, carries a practical lesson in reading the dials of a kilowatt-hour meter and bears the inscription, "Tack this card up near your meter."



CARD SHOWING THE VARIATION OF LIGHTING HOURS DURING WINTER AND SUMMER MONTHS

Illumination and Wiring

Milwaukee Street-Lighting Survey

Plans for the illumination of all the streets of Milwaukee, Wis., within the 28-sq. mile area of the city, are being prepared by the local supervisor of public lighting, Mr. F. G. Vaughn, and his associates, Messrs. Arthur Sweet and H. J. Meyer. In the business districts lamps will be mounted on 30-ft. and 22.5-ft standards, and in the residential sections 22.5-ft. posts will be used at the corners, with smaller units on 15-ft. standards at 120-ft. intervals along the curb, preserving an eight-to-one ratio between the distance between lamps and the mounting height. Series-type nitrogen-filled incandescent lamps will probably be favored for general use, on account of their efficiency, simplicity and freedom from the need for constant attention. although magnetite and flame-arc lamps are receiving consideration on account of the claims made for them of slightly lower operating cost, including trimming, electrodes, etc. The nitrogen-filled lamps are expected to require about four renewals per year and have the advantage that units of different sizes may be used interchangeably on the same circuit. Both concrete and steel posts have been designed for supporting the lamp units, which will be inclosed in special refractors mounted on harp-bracket arms of pressed metal. The plans and recommendations for Milwaukee's new street lighting, which will be submitted to the local council about March 1, will show detailed locations for about 14,000 lamps with specifications for a complete distribution system beginning at the busbars. A flexible arrangement is being studied so that the plans will be available whether energy is purchased locally or manufactured in the city plant which it has been proposed to build. Consideration is also being taken of gas for lighting parts of the residence sections where such service is already installed.

Automobile Military Projectors for the French Army

It has been truly said that the automobile is playing a very important part in the great war that is at present taking place in Europe. Not only are motor vehicles being employed for the transportation of soldiers and supplies of all kinds, gun haulage and ambulance work, but they are also being used in many other directions, interesting among which from an electrical point of view is that of automobile projector plants. The accompanying illustrations depict various views of the plant of this type which is being used in connection with the operations of the French army. The searchlamps, which are of the Breguet pattern, are mounted on light, independent trucks so arranged that they can either be used on the 18-hp De Dion motor trucks on which they are transported or can be dismounted from the latter and placed at any desired point within a range of 100 yd. of the truck, the vehicle being provided with sloping channels and tackle for the purpose. The necessary energy for the operation of the searchlamps is provided by a dynamo on the truck at the rear of the driver's seat and driven by the main engine. The projectors are mounted on turntables so that they may be instantly swung round to any desired position. They are also adjustable as to the angle at which the

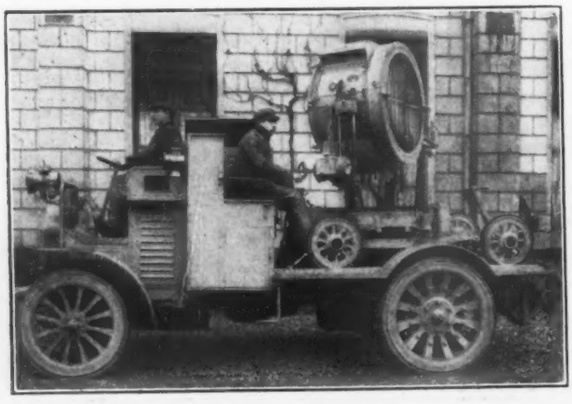


FIG. 1—AUTOMOBILE SEARCHLIGHT PLANT

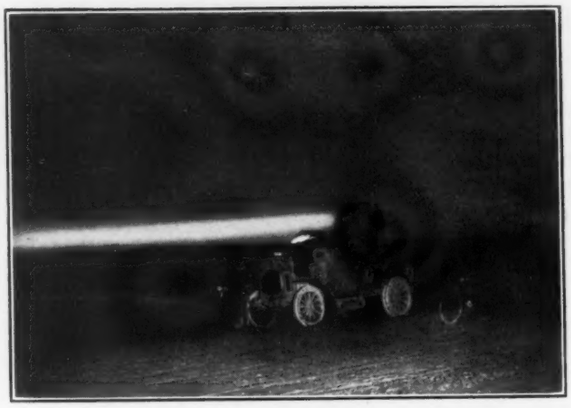


FIG. 2—AUTOMOBILE SEARCHLIGHT IN OPERATION

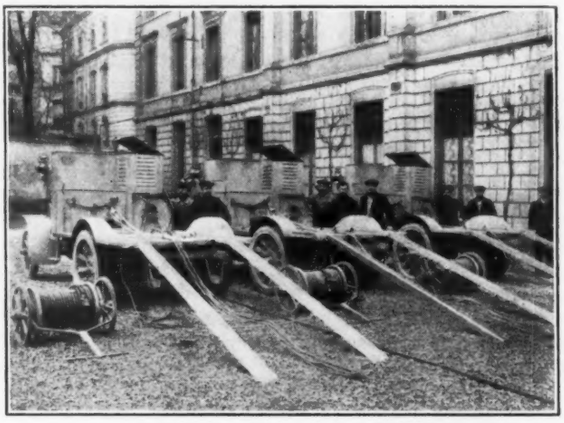


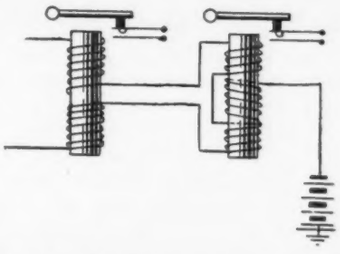
FIG. 3—DYNAMO BOX, CABLE DRUM AND PROJECTOR-DISMOUNTING GEAR

FIG. 4—PROJECTORS DISMOUNTED FROM TRUCKS

powerful beam of light is projected. When the searchlamps are used at some distance from their wagon the energy is conveyed by a cable mounted on a reel which forms part of the equipment. It is stated that the French army possesses no less than fifty machines of the type illustrated.

Recent Telephone Patent

In automatic systems there are two selecting functions to be carried on over the subscriber's line. First, there must be some differentiation so that the various selecting means will be effective in proper sequence, and, second, current impulses must be set up to control the advance of the wipers. In order to accomplish the former functions Mr. W. R. Binkley, of New Bedford, Mass., has devised a combination of two differential



AUTOMATIC TELEPHONE EXCHANGE SYSTEM

relays, one with two windings and one with three. One end of one of these windings is connected to a grounded battery while the other end is connected to both of the remaining windings. The free ends of these windings are connected respectively to the two windings of the second two-winding differential relay and thence to the two-line limbs. The three-winding relay is arranged so that the two end windings balance, while the lower one will also balance the middle with the same current flowing. These relays have three joint conditions for different applications of ground to the subscriber's line. If both sides are grounded, the double-wound relay fails and the triple-wound relay operates in response to the unbalanced middle winding with double current. If the upper side alone is grounded, both relays operate, the upper-end winding of the triple-wound relay augmenting the middle winding. If the lower-line limb is grounded, both relays operate. This combination of conditions offers opportunity for operating, circuit-change and release actions.

Letter to the Editors

Public Service Commissions and Demand Rates

To the Editors of the Electrical World:

SIRS:—It is desirable to direct attention to some of the benefits of commission regulation.

The principal point is in the matter of rates, particularly electrical rates. The principle of charging for electrical energy is changing slowly from the kilowatt-hour basis to the demand basis. That is to say, instead of charging all consumers on the basis of only the quantity used, their demand on the peak is also provided for. This has come about through the operation of an economic law which has been crystallized into the civil law and provides that the charge for service shall be as near as practicable to the cost of service. In making rates some commissions have followed this law. The result has been the introduction of the demand rate, usually stated in the form of a primary, secondary and excess charge for certain specified "hours' use per month of the active connected load." Sometimes this is stated as the "kilowatt-hours per month per kilowatt of active connected load."

Some central-station managers have not yet awakened to the fact that this rate is a business-building rate because it is equitable and scientifically and economically correct. It is based on the theory that the cost of service is divided into demand costs and output costs. The rate to any consumer is automatically reduced in proportion to the number of kilowatt-hours he uses per month or to the number of hours he uses his demand.

It is acknowledged that at first sight a rate of this kind is not simple. The expressions "thirty hours' use of active load per month" and "30 kw-hr. per month per kilowatt of active load" are confusing to the person who has not given them some thought. They resemble the expression for acceleration, "feet per second per second," which is not understood easily without some thought.

It would be as absurd to condemn this system of rates because one refuses to take the time to understand it as it would be to refuse to consider the purchase of a prime mover which would save him money because he did not at first understand its operation.

The theory of this type of rate schedule is one thing and its practical operation quite another. At first sight it looks as if it would keep the accounting department up nights figuring bills. It will be found that it lends itself to the use of tables as easily as any straight rate, so that bills do not have to be calculated at all but simply copied from a table made once and for all.

One of the most prominent public utility commissioners expressed the opinion that if operators do not educate themselves and their consumers to the understanding of this rate complications will follow. The tendency of legislatures is to establish straight uniform rates. In some legislatures every session calls up one or more of such bills, which are usually killed in the committee room by those who know that they would be bad for both the consumer and the utility. It is evident that business could not be built on a rate of this kind any more than eggs could be sold at a given constant price regardless of the quantity purchased.

It is therefore desired to sound a note of warning in connection with this matter. The sooner operators educate themselves to the thorough understanding of the demand system of rates and adopt them, the sooner will they reap the benefits of commission regulation and head off legislation for uniform rates.

Another point to which attention is directed is the attitude assumed by some operators regarding complaints on service, bills, etc., in commission-regulated states. They take "the easiest way" and explain that the commission established the rate or rule and that they have nothing to do with it. This attitude is certain ultimate suicide. It will eventually deprive the central station of such benefits as may have existed by virtue of the commission, however small they may be believed to be. Besides, it is a confession on the part of a manager that he is not able to run his own business. Commissions are not appointed to manage but to regulate. The public utility operator should be jealous of his right to operate his business in his own way so long as he is within the law.

When a rate adjustment is necessary the utility should take the offensive and seek to establish its own rates and not permit the commission to establish them. Of course, they must be approved by the commission by law, but the utility should conduct its own affairs in this respect.

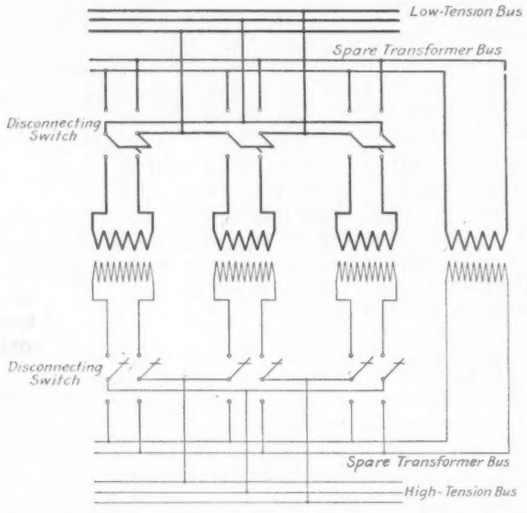
Milwaukee, Wis. HARRY G. D. NUTTING.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Spare Transformer Connections to Shorten Service Interruptions

Where the voltage of a three-phase circuit must be stepped down by single-phase transformers to feed very large loads it is usual to install one spare unit which



TRANSFORMER CONNECTION TO FACILITATE RAPID REPLACING

can be connected in place of one of the regular transformers if it becomes disabled. While always having an extra unit convenient often saves considerable delay in restoring service if one of the regular ones becomes inoperative, interruptions could be considerably shortened if the spare transformer could be instantly connected in place of the defective one without waiting to install wires. The accompanying drawing indicates an installation in which the spare unit is permanently connected to primary and secondary spare buses. In each regular transformer's leads are double-throw disconnecting switches whose hinges are connected as shown to the low-tension and high-tension buses as the case may be. The lips on one side of the hinges are connected to the spare buses and the remaining lips are connected to their respective transformers. This arrangement was described in a paper presented recently before the Association of Iron and Steel Electrical Engineers by Mr. Saul Lavine.

Exhaust Valve Repaired While Engine Runs

The main prime mover in the generating station at Independence, Kan., is a double-acting, twin-cylinder Strait gas engine, and at one time when this machine was needed to help carry the load an exhaust valve began to give trouble. Shutting off the gas and ignition from the cylinder affected, the men on duty opened the valve chest, took out the defective valve and replaced it in less than three hours without stopping the engine. The greatest difficulty experienced came from exhaust gases which backed up through the manifold from other cylinders. This trouble was overcome, however, by placing a small motor-driven forge blower in such a position that its blast drove these foul gases away from the workman's face.

Discarded Smokestack Makes a Serviceable Water Tank

When the increasing load on the station of the Topeka (Kan.) Edison Company made it necessary to supply more draft for the boilers, a new concrete stack was erected to replace the old steel stack, which had been doing service for many years. When used as a smokestack this steel tube was 200 ft. high and 8 ft. in diameter, but as soon as the duties of supplying draft were transferred to the new concrete stack the steel stack was greatly reduced in height, as indicated in the accompanying picture.

A 0.625-in. plate made of reinforced boiler iron was also placed inside and near the base of the stack, converting it into a 35-ft. by 8-ft. water tank. Now water from the wooden tanks of the company's water-treating system is pumped into this steel retainer and later is delivered to the feed-water heaters by gravity. Mr. S. R. Saylor, acting chief engineer, says that the old steel stack has become a very useful part of the company's water system.

OLD STACK USED AS WATER TANK

Encouraging Firemen to Do More Efficient Work

In the electric-lighting station at Emporia, Kan., an improvised economy chart is being used to show firemen the comparative operating results obtained through proper and improper firing. A corner of the chart,

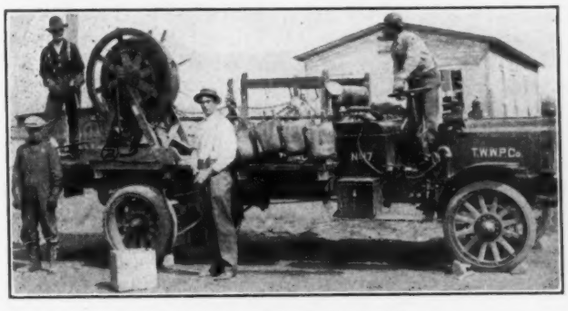
SHIFT NO. 1						
FIREMAN'S NAME	KILOWATT HRS. OUTPUT	COAL IN POUNDS	BOILERS OPERATED	ENGINES OPERATED	COAL PER KW.-HR.	FIREM NAM

PORTION OF A HOME-MADE ECONOMY CHART

which is kept from day to day on a ruled blackboard, is reproduced in the sketch herewith. Opposite each fireman's name in a horizontal line are data indicating whether or not his work has been carried out as efficiently as that of his fellows. Watching the chart with interest, each fireman is stimulated by a spirit of rivalry to make his period on duty appear favorably on the blackboard.

Reeling Up Line Wire with Auto Truck

The accompanying illustration shows one method used by the Washington Water Power Company, Spokane, Wash., for reeling up old line wire. According to Mr. Lewis A. Lewis, of that company, who contributed the



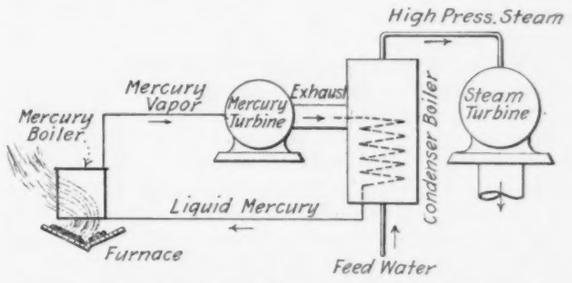
REELING WITH AUTO TRUCK

arrangement as a "wrinkle" to the recent convention of the Northwest Electric Light and Power Association, the auto truck is propped up so that the rear wheels are clear of the ground and the reel is driven from the truck wheel by means of a rope belt and a belt tightener.

The Mercury-Steam Turbine

I understand that a turbine using mercury vapor as the expansive fluid is now being developed for commercial use. Does the plan contemplate the replacement of the steam in the ordinary boiler by mercury vapor, or will the mercury be used as an adjunct to the present steam-turbine equipment? What is the proposed scheme of operation and what will be the advantages in increased efficiency, etc., of the mercury turbine as compared with present steam units? E. M. L.

The efficiency of any heat engine depends, of course, on the range in temperature between inlet and exhaust. With the lower limit of exhaust temperature fixed by that of the cooling water, efficiency improvements must result from higher inlet temperatures, taking advantage of the high temperatures available in the flue gases. But steam temperatures and pressures cannot be raised indefinitely, for steam at a temperature of 390 deg. Fahr. has a pressure of 200 lb. per sq. in., and much beyond this it is impracticable to go on account of operating difficulties. Mercury, however, boils at 675 deg. Fahr., at atmospheric pressure, and condenses in a 28-in. vacuum at 415 deg. Fahr. In addition to its high boiling point and operating range, mercury has a high atomic weight and high vapor density. The volume of its vapor is about one-eighth that of steam, thus reducing the necessity for high velocities. Its heat conductivity is almost equal to that of copper, and a mercury boiler may be operated absolutely without scale. The low spouting velocity of mercury vapor as compared with steam also makes possible the use of simple impulse wheels for utilizing the energy of the vapor. In comparison with a theoretical steam velocity of 40,000 ft. per second, the spouting velocity of mercury vapor is about 1000 ft. per second. Principal among the objections which have hitherto stood in the way of mercury as an expansible fluid is the cost of the liquid metal. One pound, having a volume of about 2 cu. in., costs 60 cents. Mercury vapor is, moreover, poisonous, and it is insidious in its effects on the human system if allowed to escape into the air. Evidently, therefore, from reasons of both safety and economy, some means must be provided for collecting and returning the exhaust from a mercury turbine. To take advantage of the high-temperature operating range of mercury vapor already referred to, the proposal has been made to install a mercury boiler in the hottest part of a furnace setting, using the mercury vapor from this boiler to drive a single-stage mercury turbine. The exhaust from the mercury turbine would then be conducted to a condenser apparatus, where the mercury would be condensed to liquid form, ready for use again. In condensing, however, at a temperature above 400 deg. Fahr., the mercury vapor would liberate heat capable of generating high-pressure steam in the shell of the condenser apparatus. The latter would, therefore, serve both as a condenser for the mercury cycle and as a boiler for generating steam. Steam from this boiler would then be led off to a steam turbine and utilized in the usual way. The scheme of operation will be made clear by the accompanying sketch. The interposition of the mercury system between the furnace and steam boiler obviously makes available the energy in the furnace gases between the temperature of the mercury vapor and that of the maximum practical steam pressure. There would be effected, therefore, a net saving of the power generated by the mercury turbine. The proposal has also been made to install such unit mercury turbines on existing boiler units. The



MERCURY-TURBINE SYSTEM AND METHOD OF GENERATING STEAM FOR USE IN STEAM TURBINE

mercury equipment is compact, and after extracting the quota of energy secured through the mercury turbine the full steam rating of the boiler would be available as before. Experimental boilers have been built up of groups of copper tubes with small, flat passages.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Shunt Three-Phase Commutator Motor.—H. K. SCHRAGE.—An English translation in abstract of his recent German paper on a new type of three-phase commutator motor with shunt characteristics. Instead of the usual complicated controller, the speed is regulated by shifting the brushes, so that no transformer whatever is needed in the new arrangement.—London *Electrician,* Oct. 30, 1914.

Polyphase Motor with Unity Power-Factor.—ALEXANDER HEYLAND.—An English translation in abstract of his recent German article on a new polyphase motor with unity power-factor.—London *Electrician,* Nov. 6, 1914.

Retardation Tests.—L. WERNER.—The first part of an article, illustrated by diagrams, in which the author describes the most convenient methods of testing dynamo-electric machines by the retardation method.—*Elek. Rundschau,* Oct. 21, 1914.

Lamps and Lighting

Standards of Radiation.—W. W. COBLENTZ.—In the first part of this paper measurements are given of the radiation from the Hefner lamp and from a standard sperm candle relative to that of a black body. The data are applicable for rough comparison of radiometers in absolute measures. The custom of specifying the radiation sensitivity in terms of the total radiation received from a standard flame per square centimeter of area of the receiver exposed at a distance of 1 m is useful and, on the assumption that the constant of total radiation of a black body is $\sigma = 5.7 \times 10^{-12}$ watt cm^{-2} $deg.^{-4}$, the following radiation relations are given: 1 sperm candle, 29 microcalories per sq. cm; 1 Hefner unit, 26 microcalories (no diaphragm), 23 microcalories (diaphragm with opening 14 mm by 50 mm); 1 Hefner unit, 0.034 sperm candle; 1 microcalorie, 0.0385 Hefner unit (no diaphragm), 0.043 Hefner unit (diaphragm with opening 14 mm by 50 mm). For refined measurements of radiation stimuli a standardized incandescent lamp is recommended for calibrating the radiometer. In the second part of this paper tabulated data are given showing the precision attained in standardizing such an incandescent lamp against a black body by means of three thermopiles having widely different constants.—*Scient. Papers, Bureau of Standards,* No. 227.

Vapor Pressure of Platinum and Molybdenum.—IRVING LANGMUIR AND G. M. J. MACKAY.—The rates of evaporation of heated platinum and molybdenum wires in high vacuum were determined over rather wide ranges of temperature. From these data the vapor pressure p (in dynes per sq. cm) of these metals was calculated. The results are given in the following two equations: $\log p = 14.09 - (27{,}800/T) - 1.26 \log T$, for platinum, and $\log p = 17.354 - (38{,}600/T) - 1.26 \log T$, for molybdenum, where T is the absolute temperature. The vapor pressure of platinum in millimeters of mercury is 324×10^{-20}, at 1000 deg. absolute; it is 107×10^{-6} at 2000 deg. absolute and 760 mm at 4180 deg. absolute. The vapor pressure of molybdenum is 6.43×10^{-8} mm at 1800 deg. absolute; it is 43×10^{-4} at 2500 deg. absolute and 760 mm at 3890 deg. absolute. These results are found to be in moderately good agreement with an approximate equation derived by Nernst's heat theorem.—*Phys. Rev.,* October, 1914.

Generation, Transmission and Distribution

Steam Consumption of Turbines.—An account of results of recent tests of a 1000-kw Ljungström turbo-alternator at the St. Pancras electricity works. The steam consumptions realized on the tests were considerably better than those guaranteed, as is shown by the figures given in the table. Since this turbine has been in use there is a saving in coal equivalent to about $8,500 per year. Notwithstanding the high speed of 3000 revolutions per minute and 6000 per minute between the two rotating elements, there is almost complete absence of noise or vibration. The report concludes with some interesting figures showing the progressive improvement in steam consumption with the various types of plant installed in the station since its inception in 1891. Thus, while the full-load consumption of the reciprocating plant improved from 26.6 lb. to 19.5 lb. per kw on full load, the first direct-current turbo-generator in 1906 gave a figure of 17, which was lowered to 16.15 by the 2200-kw turbo-alternator of 1909. Now 12.75 lb. has been reached with the Ljungström set mentioned above, while 11.8 lb. per kw-hr. is guaranteed for the 5000-kw machine which is to be installed, and it is hoped that this will be improved upon when the tests come to be made. The improvement at fractional loads is even more remarkable.—London *Elec. Eng'ing,* Oct. 29, 1914.

STEAM CONSUMPTION IN POUNDS PER KILOWATT-HOUR

	Full Load	Three-quarters Load	Half Load	Quarter Load
Actual consumption	12.75	13.57	14.67	17.75
Guaranteed consumption	14.00	14.75	16.50	19.75

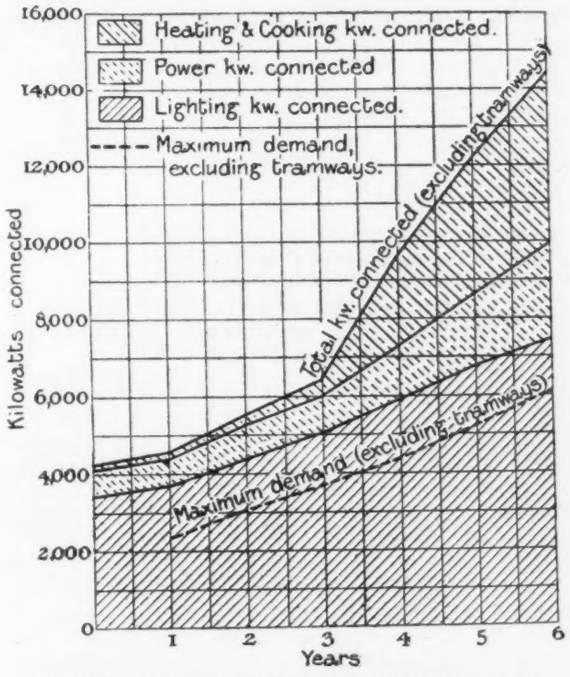
Traction

Subways.—BRUGSCH AND BRISKE.—The first part of an illustrated article on the ventilation of subways and tunnels.—*Elek. Kraftbetr. u. Bahnen,* Sept. 24, 1914.

Installations, Systems and Appliances

Bulk Supply, Domestic Supply, Future Prices of Electricity.—SIR JOHN SNELL.—An abstract of his presidential address to the (British) Institution of Electrical Engineers. In the introduction the author refers to the work of the institution with respect to education, papers, the late industrial committee, lectures, remuneration of young engineers, the national service of British electrical engineers in the present war, and legislation. The author then refers at greater length to the problems of bulk supply, domestic electricity and probable future prices to consumers. With respect to bulk supply he says there is no doubt that were things beginning anew instead of each small local authority installing an independent station considerable waste of money and fuel would be avoided by establishing one

large system for supplying energy to each smaller area for local distribution. While this is often true, there is, however, another side to the question. It may be generally said that once a small station is built and the expenditure has been incurred, then, and so long as the system is kept within defined limits of extension, the extra cost of operating an addition to the small station is often less than the cost of any commercially feasible bulk supply. The author suggests that a complete survey be made by the Local Government Board of the present position of all the electrical authorities, so that in those cases where amalgamation of electrical interests or purchase of energy from some outside source for local distribution ought to be adopted in lieu of a local extension of plant, the board would decline to sanction any loans for the proposed extension of local plant. In discussing domestic electricity supply he urges that the supply of energy for lighting on the one hand and for heating and cooking on the other should not be differentiated in the consumer's installation by two sets of wiring. That a diversity exists between the lighting and cooking loads is clear from the diagram. It gives from



CURVES SHOWING HEATING AND COOKING LOADS

actual practice curves of connection and load illustrating the effect of heating and cooking during six years. While the lamp and motor connections are steadily rising, the heating and cooking connections are increasing at a greatly accelerated rate; but, as will be seen, the maximum load on the system is rising proportionately to the lamp and motor load only and is virtually unaffected by either the heating or the cooking additions. This demonstrates: (a) A greatly improved annual load-factor; (b) the great diversity between the heating and cooking loads and all other classes of supply; (c) not only the consequent better utilization of the generating plant but also that of the feeders and distributing mains. Load curves showed that the daily load-factor in the summer had increased from 26 per cent to 37 per cent for comparable days in three successive years, and in the winter from 38 per cent to 42 per cent. All the rate schedules that have been tried have been really narrowed down to three kinds, namely (1) the assessment system, (2) the fixed-charges system, and (3) a flat rate. The fixed-light system is a special adaptation of the second kind. For some time to come the two first-mentioned systems will no doubt find increasing favor, because they are more readily and justly adaptable to the various domestic needs, whether lighting alone, heating alone, cooking alone, or any combination of them. The author then takes up the problem of future charges to consumers. He thinks it unwise to speak of such low prices as ¼ cent or ½ cent per kw-hr. for general supply. He gives figures of generating cost on a large scale under ideal conditions and shows that there are two chief items of cost, fuel and capital charges. Even if the fuel charges could be eliminated, the average cost would be reduced comparatively little. The author finally gives the following figures for capital invested in the electrical undertakings and costs in the British Empire: 310 manufacturing companies, $233,515,235; 178 miscellaneous companies, $43,782,-085; telegraphs and telephones, $186,245,440; 269 electrical-supply companies, $291,824,425; 262 municipalities, $248,284,755; 110 tramway undertakings, $280,-062,330; total, $1,283,714,270. This huge total does not include government telegraphs and telephones, power companies, or the capital invested by railway companies in electrification, which would greatly increase it. In conclusion, the author briefly refers to the trend of improvements in various fields of electrical industries.—London *Electrician*, Nov. 6, 1914.

Electrophysics and Magnetism

Production of Soft Roentgen Radiation by the Impact of Positive and Slow Cathode Rays.—SIR J. J. THOMSON.—A gap of about eight octaves separates the softest characteristic Roentgen radiation yet investigated—that of aluminum—and the shortest waves in the Schumann region—those recently discovered by Professor Lyman; the latter have a wave-length of about 9×10^{-6} cm, the former one of 3.6×10^{-5} cm. Very little is known about any radiation of intermediate wave-length, and yet the study of such radiation is essential for the determination of the structure of the atom. By its aid one might hope to gain a knowledge of the distribution of the electrons in the atom, to determine, for example, how many rings of electrons there are in the atom and the number of electrons in each ring. One associates the K and L types of radiation with the vibrations of the two rings nearest the center of the atom, and the visible spectrum with those of the outermost ring. By using Roentgen radiation ranging in hardness from that characteristic of aluminum to the hardest we can produce we can detect the existence and study the properties of the two rings nearest the center. By using the light of the visible and ultra-violet region we can find out a good deal about the outermost ring, but to study the intermediate rings, and thus get even an approach to the constitution of the atom, we require radiation intermediate between Schumann and ordinary Roentgen rays, a type of radiation which has not hitherto attracted much attention. The author discussed two methods of producing radiation of this type. A description is given of a new method based on the fact that when positive rays impinge against a solid radiation of this type is produced. The second method depends up the production of solf Roentgen radiation by the impact of slow cathode rays.—*Philos. Mag.*, October, 1914.

Contact Potentials in Vacuo.—ALBERT E. HENNINGS.—An illustrated account of a study of contact potentials and photo-electric properties of metals (freed from gas or oxide films) in vacuo and the mutual relation between these phenomena. The contact potentials of the metals are not noticeably changed by differences in pressure ranging from atmospheric pressure to that of the best vacuum obtained. All the metals are rendered

more electropositive when polished in vacuo and gradually become more electronegative just as do freshly polished surfaces in air. Prolonged illumination with ultra-violet light greatly modifies the contact potentials of film surfaces, and whatever the direction or magnitude of the change may be, each metal exhibits a tendency to recover its original potential when the action of the light has ceased. With newly prepared surfaces these changes are negligible or inappreciable. On the photo-electric side the results as a whole confirm the point of view adopted by Richardson and Compton in regard to the relation between photo and contact potentials. The photo-sensitiveness of all the metals is very largely increased when the surface films, which in general always exist even in the best vacuum unless the metals have been subjected to special treatment, are removed. Although the order of the metals when arranged according to their photo-sensitiveness in vacuo is usually not at all that of the Volta contact series, the order assumed by freshly cleaned metals approaches very closely that of this series.—*Phys. Rev.*, September, 1914.

Hysteresis Loss as a Function of Magnetic Density and Maximum Permeability.—John D. Ball.—K. Zickler has formerly given for sheet iron a mathematical relation between hysteresis loss and maximum permeability and induction. The present author gives numerous tables which show that Zickler's rule fails in many cases and its application is valid only within very narrow limits, within which the properties of the material are exactly known. Within wide limits it is not permissible to assume the hysteresis loss to be inversely proportional to the maximum permeability. In the same issue Zickler replies to the criticism and agrees that his rule was based on experiments with too small a number of sheet-iron samples. He indicates how it may be possible for special alloy sheets containing silicon to take into account the effect of silicon.—*Elek. u. Masch.* (Vienna), Oct. 4, 1914.

Units, Measurements and Instruments

Braun Tube.—F. C. Kock.—An illustrated description of a modification of the Braun cathode-ray tube for the direct representation of alternating-current curves so that the tube may be used as an inexpensive substitute for an oscillograph.—*Phys. Zeit.*, Oct. 1, 1914.

Gold-Leaf Electroscope.—Giovanni Costanzo.—A brief note stating that the sensitiveness of a gold-leaf electroscope is increased if for the usual rectangular form of the gold leaf there be substituted the triangular form obtained by cutting the rectangle into two halves along one diagonal.—*Phys. Zeit.*, Oct. 1, 1914.

String Galvanometer.—W. H. Apthorpe.—An illustrated note on an improvement in the Einthoven string galvanometer by which it becomes possible with one instrument to obtain simultaneously two records on the same plate.—London *Electrician*, Oct. 30, 1914.

Telegraphy, Telephony and Signals

Effects of Three-Phase High-Tension Line on Telephone Lines.—O. Brauns.—The first part of a mathematical paper in which the author investigates the effect upon telephone lines of switching operations and accidental earth faults in neighboring high-tension transmission lines.—*Teleg. u. Fernspr. Technik*, Oct 15, 1914.

Atmosphere Refraction in Wireless Telegraphy.—J. A. Fleming.—An abstract of a (British) Physical Society paper of a theoretical nature on atmosphere refraction and its bearing on the transmission of electromagnetic waves round the earth surface. The author's considerations show how closely the possible range of long-distance radiotelegraphy is connected both with the size of the planet and the nature of the atmosphere in which it is conducted. Having regard to the great variations which exist in planetary atmospheres, it is quite possible that our earth is unique in this respect, as in many others, in being perhaps the only planet on which long-distance wireless telegraphy is possible.—London *Electrician*, Nov. 6, 1914.

Cable Telegraphy.—H. W. Malcolm.—A continuation of his highly mathematical serial on the future progress of cable telegraphy, in which an analytical study is made of the problem of increasing the speed of the submarine telegraph cable and of rendering it, if possible, distortionless. In the present instalment he gives the theory of the shunted condenser.—London *Electrician*, Nov. 6, 1914.

Miscellaneous

Italy.—An article giving statistical tables of the imports of electrical goods into Italy in 1912 from various countries, with a comparison with the year 1911. Tables of the export trade are also given.—London *Elec. Review*, Oct. 9, 1914.

Riveting.—An illustrated article on two Swiss systems of electrohydraulic riveting machines—those of H. Spillman and of the Oerlikon company respectively. The advantages of the electro-hydraulic system over other systems of riveting are discussed, especially easiness of attendance, high efficiency and low-power consumption.—*Schweizer Bauzeitung*, Oct. 24, 1914.

Book Reviews

Proceedings of the National Foreign Trade Convention. Foreign Trade Council, New York. 474 pages. Price, $1.50.

The bound volume containing the official report of the National Foreign Trade Convention held at Washington, D. C., on May 27 and 28, 1914, is particularly timely. It contains the papers and discussions, the speeches made at the banquet and the preambles and resolutions adopted by the convention. Among those whose papers are given are Mr. W. C. Redfield, Secretary of Commerce; Mr. James A. Farrell, president of the United States Steel Corporation; Mr. James J. Hill, chairman of the Great Northern Railway Company; Mr. John D. Ryan, president of the Amalgamated Copper Company; Mr. Willard Straight, of J. P. Morgan & Company; Mr. W. J. Bryan, Secretary of State; Mr. Charles A. Conant, Mr. Edward N. Hurley, Hurley Machine Company, and Mr. M. A. Oudin, General Electric Company.

Costruzioni Elettromeccaniche. Vol. II. By Prof. Ettore Morelli. Turin, Italy: Unione Tipografico-Editrice Torinese. 192 pages, 171 illus. Price, paper, $1.

This is the second volume of the "Electromechanical Construction" series and is devoted to alternating-current machinery, and especially to alternating-current generators. The book is divided into three chapters, relating respectively to types of alternator construction, mechanical parts of the armature and electrical parts of the armature. The treatment of the subject is mainly from the standpoint of mechanical construction, and many prints of machine drawings illustrate the text. The descriptions are clear and the mathematical discussions simple. The work will be of special interest to designers of alternating-current machinery desirous of acquainting themselves with the details of south European practice.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Lighting Fixture for Garages

In the accompanying illustration is shown a portable fixture for use in garages, which is being made by Frank W. Morse, 516 Atlantic Avenue, Boston, Mass. Use is made of a 16-cp round lamp equipped with a

PORTABLE LAMP FOR GARAGES

vaporproof globe, a reflector, a guard and a waterproof socket which is placed in the handle. A cord 12 ft. long and a two-piece plug are used with the lamp.

Liberty Bell Adjustable Lamp

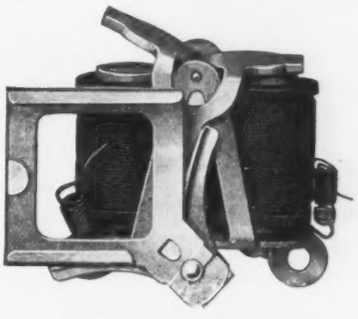
A portable lamp which can be used as a table, bracket or indirect lighting unit is being manufactured by the Hallbauer-Hardman Manufacturing Company, Schenectady, N. Y. The reflector, which is designed to repre-

PORTABLE LAMP IN USE WITH PIANO

sent a bell, is free to move about pivots on the ends of a U-shaped jaw fastened to a heavily weighted base. The incandescent lamp, which is supported just within the mouth of the bell, can also be tilted as can the U-shaped jaw. From a reading lamp it can be quickly converted into a bracket lamp by fastening the disappearing clamp in the base to a bed, shaving mirror, dresser, etc. In the accompanying illustration the lamp is shown as an overhanging lamp for the piano, desk, etc. If desirable, the reflector can be completely reversed to give indirect illumination. The device is made of brass with a brushed finish.

Electrically Reset Annunciator Drop

The electrically restored target-annunciator drop shown herewith is made by Edwards & Company, 140th and Exterior Streets, New York City. The device consists of two electromagnets over which is pivoted a rocker-type armature carrying an arm which transmits its motion to the target by sliding over a V-shaped piece attached thereto. This mechanism is not affected by vibration as the shutter is locked in each extreme position by the end of the armature arm bearing against one side of the V. Upon energizing the right-hand magnet the target is thrown to the left, after which it may be returned to its former position by energizing the other magnet. The reset coils in an annunciator box



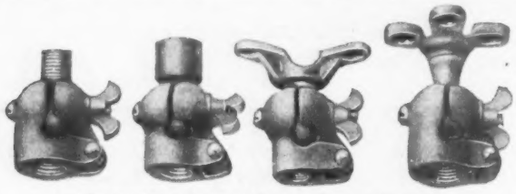
ANNUNCIATOR DROP

may be connected to one circuit for simultaneous resetting or may be controlled separately from individual push-buttons. The annunciator can therefore be placed above reach as under normal conditions it never has to be touched.

Ball-and-Socket-Joint Hickey

Wiremen and fixture hangers occasionally find outlet boxes installed askew or studs and drops inclined from the correct position. To facilitate attaching fixtures when these conditions exist there has been developed recently a ball-and-socket-joint hickey which can be adjusted to align a 6-ft. fixture that is 24 in. out of plumb. By cutting off one side of the cup it is possible to allow for an adjustment of 45 deg., which is very desirable on sloping ceilings such as are found in theaters and buildings having saw-tooth roofs. The device, which is made of malleable iron, can be furnished with a tripod, crowfoot or outlet-box stud. It can also be made to fit either a male or female insulating joint of 0.25-in. or 0.375-in. standard-pipe size and fixture stems of 0.125-in., 0.25-in. or 0.375-in. standard pipe. It is declared that 10 to 25 per cent of the time consumed in hanging a fixture

with the ordinary hickey can be saved by using this device. After the crowfoot or insulating joint has been attached to the hickey the fixture is hung by slipping a bolt through the hole in the ball, swinging up the hinged half of the cup and screwing up the wing nut.

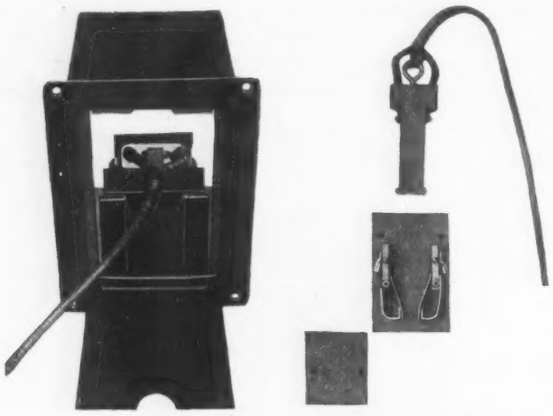


ADJUSTABLE SUPPORT FOR FIXTURES

With the latter tightened the joint is rigid so that the fixture cannot twist or swing. The manufacturer of this device is the Wilton Manufacturing Company, Wrightsville, Pa.

Stage Receptacle

A stage receptacle and plug has recently been developed by the A. G. Electric & Manufacturing Company, 905 South Howard Avenue, Seattle, Wash. The box is of wrought iron, the front being quite heavy to



FIGS. 1 AND 2—STAGE RECEPTACLE ASSEMBLED AND DISASSEMBLED

withstand wear. The receptacle is shown in Fig. 1 with door open; in Fig. 2 are shown the unassembled parts. A double-break mechanism is provided, preventing danger of short-circuits.

Automobile Dashboard Lamp

A lamp which can be placed on any part of an automobile dashboard and can be easily removed if desired is shown in the accompanying illustration. When removed from the bracket the cord unwinds so that the lamp can be utilized in any part of the car. A crank is provided for winding up the cord when replacing the lamp on the dashboard. The "auto-dashlight," as the lamp is called, is being made by the L. A. Williamson Company, 258 Broadway, New York.

LAMP ON AUTOMOBILE DASHBOARD

Adjustable Automobile Searchlamp

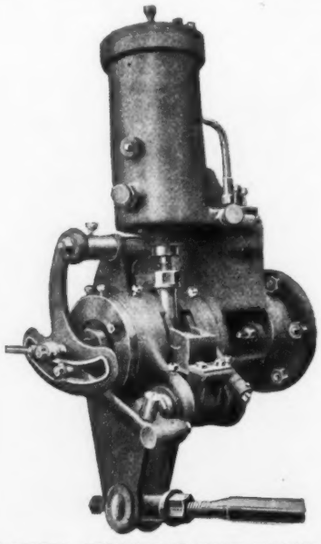
A small adjustable searchlamp which can be attached to the wind shield of an automobile and placed at any angle desired has recently been developed by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa. The lamp can be easily detached and used as a trouble

AUTOMOBILE SEARCHLIGHT

finder. The light is supplied by a 6-volt tungsten lamp and passes through two lenses. The device is finished in nickel. In the accompanying illustration the searchlamp is shown in use for inspecting purposes.

Valve Gear for High-Speed Corliss Engine

In the *Electrical World* of June 6, 1914, was described a long-range valve gear designed to reimburse the flywheel of Corliss engines operating at ordinary speeds with energy by taking steam for full stroke until full



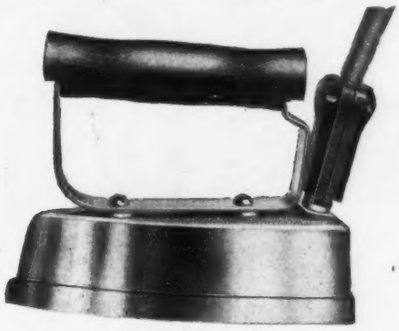
HIGH-SPEED CORLISS-ENGINE VALVE GEAR

control is obtained by the governor. The valve gear shown in the accompanying illustration is designed for Corliss engines operating at a speed of 1500 r.p.m. or more. The entire gear is symmetrical with respect to a central plane, there being no overhung parts excepting the full-stroke cam. The

valve-arm casting rides on a large bearing formed on the bonnet itself. The valve arm carries two bearings which support the hook, one bearing being on either side of the drop arm. The valve stem has two bearings in the bonnet outside the stuffing box, and the drop arm is keyed to the stem between these two bearings. The end thrust of the stem is taken up by a hardened-steel plate in the bonnet cap. Dash-pots are provided to secure positive and sharp action to the valve gear with short travel. The valve gear is used with high-speed Corliss engines equipped with four-port valves, which are being made by the Nordberg Manufacturing Company, Milwaukee, Wis.

Electric Iron

A 6-lb. electric iron has recently been developed by the Menominee Electric Manufacturing Company, Menominee, Mich. The iron is designed for either 110



6-LB. ELECTRIC IRON

volts or 220 volts and takes 500 watts. All metal parts are nickel-plated and polished. A 10-ft. cord and attaching plug are used with the iron.

Vacuum Cleaner with Bag Near Handle

A light-weight electric vacuum cleaner with bag and motor near the handle is shown in the accompanying illustration. The weight complete is less than 7 lb. The cleaner is equipped with a long tube and a swivel-

LIGHT-WEIGHT VACUUM CLEANER

jointed nozzle which enable the operator to clean the tops of window and door frames, molding and pictures with considerable ease. The switch is in the handle. Besides an 8-in. swivel nozzle, the following equipment is also used with the machine: An 8-in. wall brush, an 8-in. hard-wood-floor plate, a 4-in. nozzle, a radiator nozzle and a library brush. The cleaner is being made by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.

Socket for Large-Sized Incandescent Lamps

The keyless porcelain socket shown herewith is designed for use with high-efficiency tungsten lamps. At 600 volts its rating is 1500 watts. The socket is equipped with a stamped brass cap, the diameter of

SOCKET DESIGNED FOR LARGE LAMPS

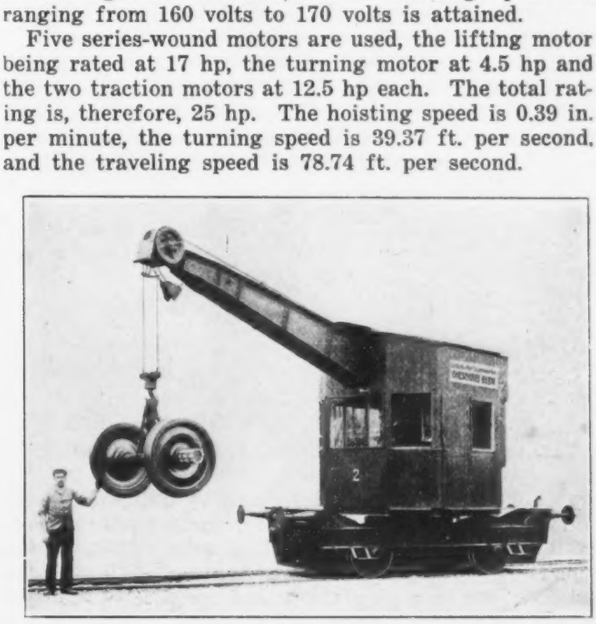
which may be 0.375 in., 0.5 in. or 0.75 in. A sealing compound, called "arrowax," which hardens with the application of heat, is used in the construction of the device. The socket is being made by the Arrow Electric Company, Hartford, Conn.

Storage-Battery Locomotive Turning Crane

A crane of the revolving-post type operating on storage batteries has been developed by the L. von Roll'schen Eisenwerke, Berne, Switzerland. It may be equipped with a hook for carrying a load, as shown in the accompanying illustration or with a bucket for carrying loose materials. The crane is designed to carry a maximum load of 5 tons at a mean radius of 19.78 ft.

The battery is rated at 185 amp-hr. and will discharge for a period of five working hours. It contains eighty elements, the output being 30 kw-hr. The battery is charged by dividing it into two groups of forty cells each, the initial pressure being from 80 volts to 85 volts, which is gradually raised until it is from 105 volts to 110 volts. The two groups of cells are connected together in series, and a discharge pressure ranging from 160 volts to 170 volts is attained.

Five series-wound motors are used, the lifting motor being rated at 17 hp, the turning motor at 4.5 hp and the two traction motors at 12.5 hp each. The total rating is, therefore, 25 hp. The hoisting speed is 0.39 in. per minute, the turning speed is 39.37 ft. per second, and the traveling speed is 78.74 ft. per second.



REVOLVING-POST CRANE OPERATING ON STORAGE BATTERIES

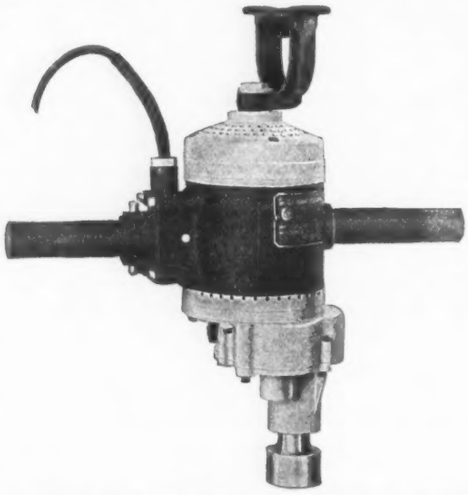
Electrically Operated Rotary Mimeograph

The motor-driven mimeograph shown herewith is being made by the A. B. Dick Company, 730 West Jackson Boulevard, Chicago, Ill. The motor is designed for operation on both alternating current and direct current, and the speed of the machine can be regulated by means of a rheostat from 20 r.p.m. to a maximum of 100 r.p.m. The belts from the motor to the large pulley and the reducing pulley to the far side of the cylinder are held taut by mounting the pulleys in the manner shown in the illustration so that the mounting acts as a hanger. The use of idlers is thereby obviated. An adjustment is provided so that the machine can be driven by hand if desired.

MOTOR-DRIVEN MIMEOGRAPH

Portable Drill for Either Alternating or Direct Current

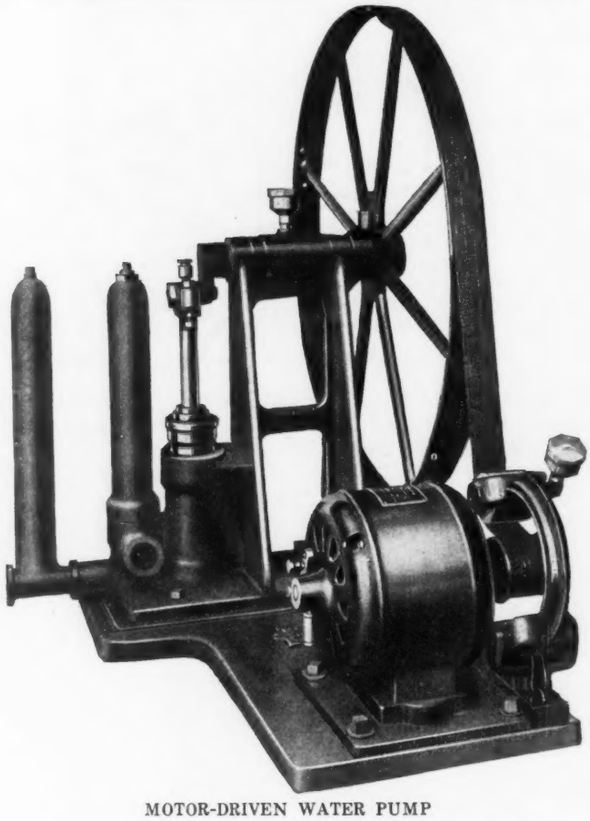
Alternating or direct current may be used to operate the portable drilling machine illustrated herewith. Machines of this type are made for drilling holes in steel up to 0.625 in. in diameter. The weights and speeds vary from 6 lb. and 2200 r.p.m. for 3/16-in. holes to 18.5 lb. and 500 r.p.m. for 0.625-in. holes. Cable connections can be made directly to the switch mechanism without disassembling the machine. A simple, quick make-and-break, multiple-type switch is employed which, it is declared, reduces arcing to a minimum. The commutator is easily accessible for surfacing or renewing brushes. All of the gears run in a lubricant, and the bronze bearings are oiled by forced lubrication. Ball bearings are employed for the armature shaft and thrust bearings. The casing, being made of aluminum, is extremely light, and ventilation for the motor is afforded through a perforated sheet-metal cover. Either chuck or socket tools can be used with this machine. It is manufactured by the Van Dorn Electric Tool Company, Cleveland, Ohio.



DRILL OPERATING ON ALTERNATING OR DIRECT CURRENT

Automatic Water Pump

An automatic motor-driven pump is illustrated herewith which is especially adapted to direct-pressure systems as it eliminates the use of storage tanks. It can be employed to pump water into the house-service pipes or may be used to increase the city-water pressure. The pump is simple in construction and is declared to be noiseless in operation. With a 1/6-hp motor which is ordinarily furnished with the set 150 gal. of water can be delivered in an hour against a pressure of 35 lb. per sq. in. gage. Either direct-current or alternating-current motors are supplied which will start under full load and will operate even with a voltage variation of 10 per cent. The automatic switch, which is operated by a pressure controller, stops the motor when the pressure in the expansion tank reaches a predetermined value and starts it again when water is drawn from the pipes. The pump is vertical, single-acting and consists of a cylinder cast in one piece with the base containing a heavy bronze piston. Only two valves are employed, which are accessible and operate without noise. Two vertical air chambers connected with the cylinder and delivery pipe prevent water hammer. The outfit is manufactured by the Bishop-Babcock-Becker Company, Cleveland, Ohio.



MOTOR-DRIVEN WATER PUMP

Electrical Merchandising for Christmastide

Necessity of Attractive Window Displays, Brightly Lighted and Appropriately Decorated Stores, Department-Store Methods and Service—Christmas Gift Suggestions

PREPARING FOR CHRISTMAS SHOPPING

Show-Window Displays and Exterior and Interior of Electric Shops Should Suggest Spirit of St. Nicholas

BY A. J. EDGELL*

A PROGRESSIVE selling policy, including competent salespeople and attractive displays of goods in show windows and store interiors, is the method that must be used by the merchant of to-day not only for the Christmas shopping season but in addition through the whole business year. The most successful are those who have put aside the frigid dignity with which the large storekeeper of a few years ago was wont to clothe himself.

CHRISTMAS GIFTS MUST BE APPROPRIATELY WRAPPED

In every line the most stately and dignified firms have had to get closer to the people. Every one who deals with the public must come to a "Public be pleased" basis. The firm operating with this policy need not worry much about its competitors, for it has an asset that often will overcome the lower-price argument of a rival. A lasting success cannot be built in the retail field without this foundation.

Big advertising will bring results for a while. Cut prices will also attract the economical, and good displays will draw a possible customer into the store. But it is the manner in which he is treated in the store that counts; for it is in the store itself and in its sales force that the final decision of the customer as to whether he will make this store his source of supply for future needs will lie. This is why the word "service" has become so big a talking point of merchants in advertising. "Service," however, means more than that. The appearance of the store exterior, the window displays, the advertising, the keeping of promises made and the aspect of the store interior are all parts of the store's "service" in the customer's mind, and it will pay every dealer in electrical merchandise to give this idea of service his best thoughts, whether he is selling appliances or supplies. There is a goodly amount of improvement possible in many electrical stores, due, no doubt, to the fact that the dealer has been too busy with other matters to give much thought to the public at large as possible customers.

Preference Given to Electric Shops

People would prefer to buy electric merchandise from an electric shop. That is a fundamental advantage that the electric merchant has over other merchants selling this class of merchandise. The public has more confidence in the statement of the electric salesman. It feels that he knows, while in other stores electric goods are part of a conglomerate stock, and the salesman sells galvanized washtubs, silver polish, grass seed or electric appliances with equal gusto. If the public can make its purchases from an electric shop under service conditions it will never procure many of its needed electrical appliances elsewhere. Right now when Christmas is approaching is the very best time to take a stand on the service basis.

Electrical Gifts Are Practical

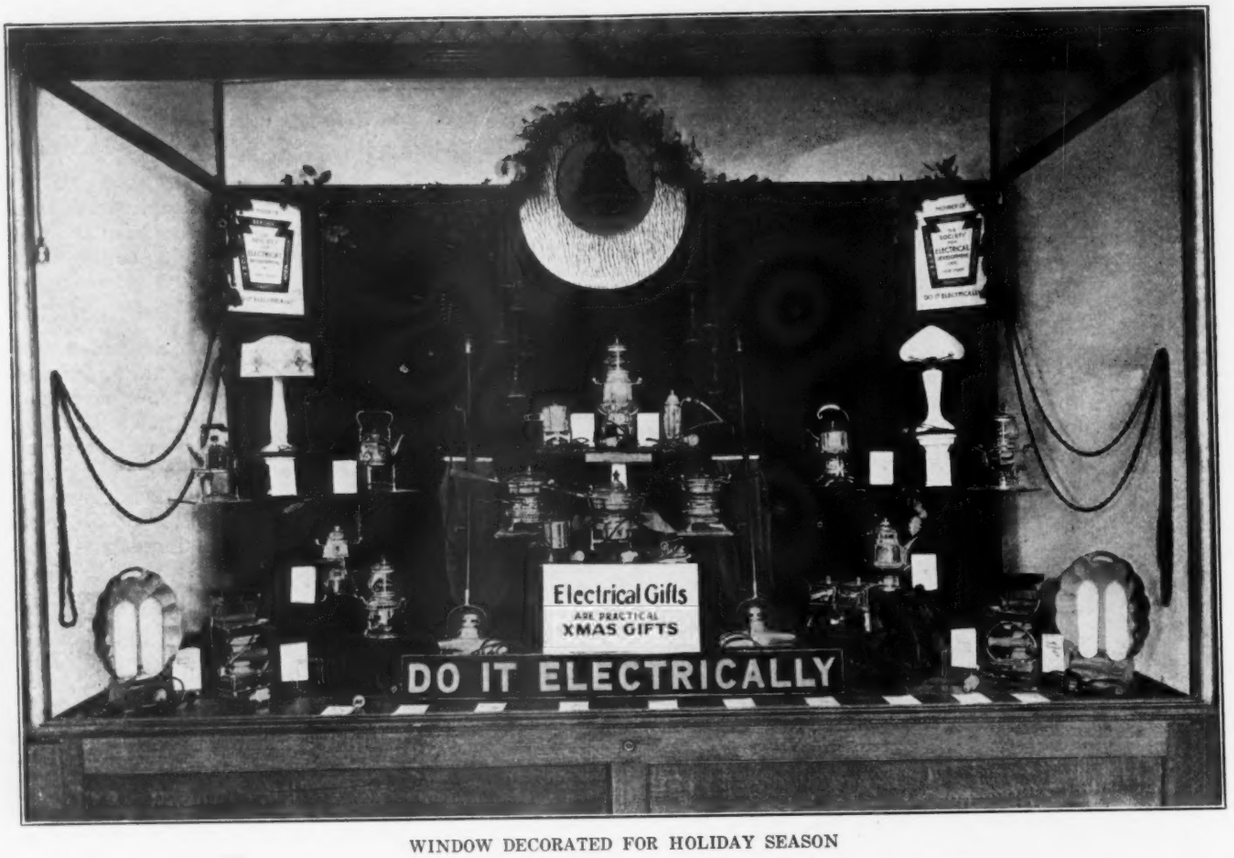
Electrical gifts are sensible, useful and acceptable. There are more arguments in favor of electrical gifts than for all others combined, and the door of opportunity is wide open to the electrical dealer. The manner of his merchandising will show whether by Christmas Eve the cash-register is so full of greenbacks that the drawer won't close. There are still more than three solid weeks available for gift-buying business.

Our Holiday Greeting
May the spirit of happiness enter every heart this Christmas Day and may the New Year bring to all health and contentment

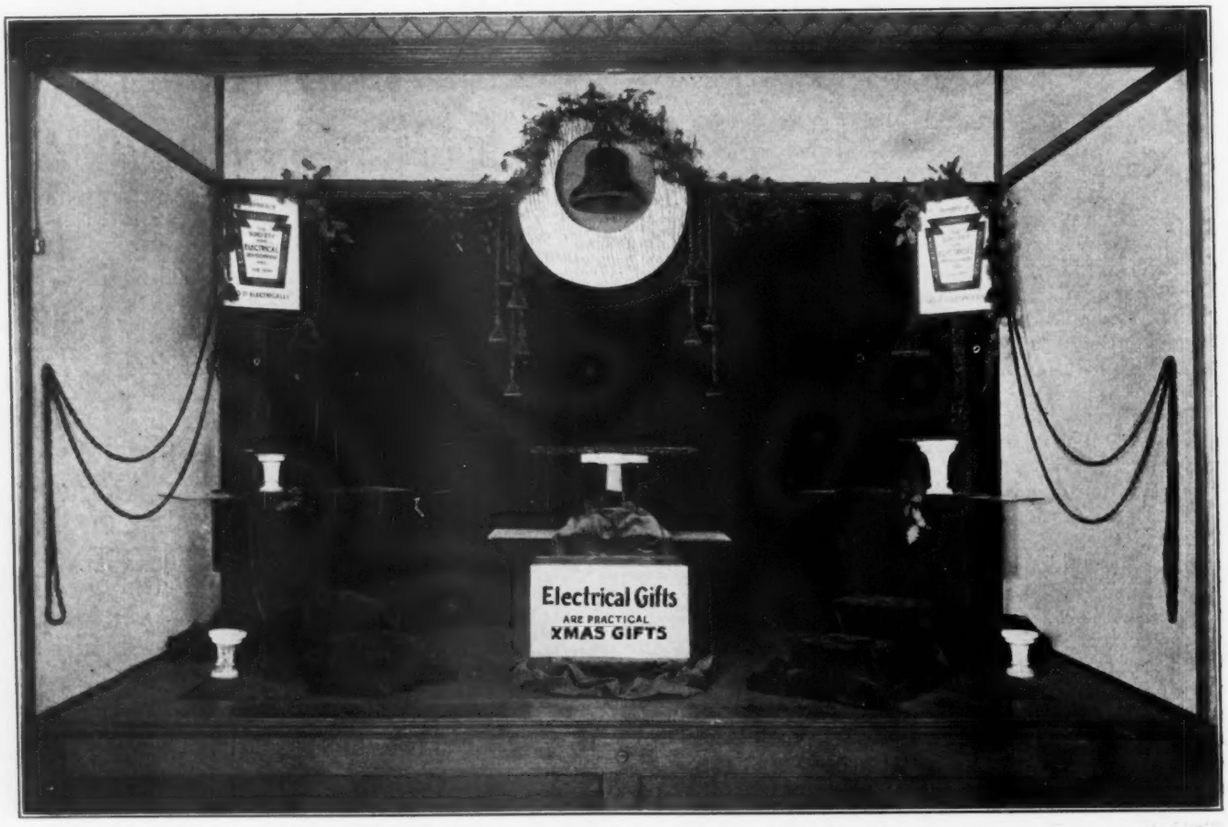
HOLIDAY GREETING CARD FOR CUSTOMERS

In their homes people are scanning the newspapers and magazines for suggestions, so that newspaper advertisements should be made up of Yuletide talk. It

* Society for Electrical Development, Inc.



WINDOW DECORATED FOR HOLIDAY SEASON

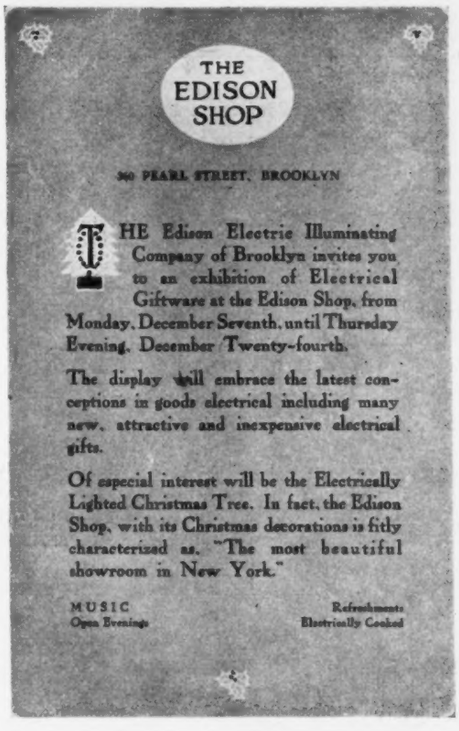


SIMPLE SETTING OF WINDOW BEFORE DECORATION

is a poor time for cold facts and prices. Christmas buying is done to a considerable extent on sentiment, so that it is advisable to make all advertising breathe the Christmas spirit to be in harmony with customers' thoughts. A touch of sentiment will first arouse interest in gift suggestions, and the practical side can be brought out later.

Attractive Exteriors and Interiors Necessary

The business district are crowded with Christmas shoppers, and the store exterior should be made attractive. People get their idea of what is within from the appearance of the store front. A clean-cut front attracts business, and during the holiday season especially the store front should be brightened up until it sparkles. Strings of colored lamps and a "Merry Christmas" electric sign with laurel roping strung across the building will impart a genuine holiday


THE
EDISON
SHOP
360 PEARL STREET, BROOKLYN
THE Edison Electric Illuminating Company of Brooklyn invites you to an exhibition of Electrical Giftware at the Edison Shop, from Monday, December Seventh, until Thursday Evening, December Twenty-fourth.
The display will embrace the latest conceptions in goods electrical including many new, attractive and inexpensive electrical gifts.
Of especial interest will be the Electrically Lighted Christmas Tree. In fact, the Edison Shop, with its Christmas decorations is fitly characterized as, "The most beautiful showroom in New York."
MUSIC
Open Evenings
Refreshments
Electrically Cooked

INVITATION ISSUED BY BROOKLYN EDISON COMPANY TO ITS PATRONS

appearance that will make the public feel that here is a Christmas store.

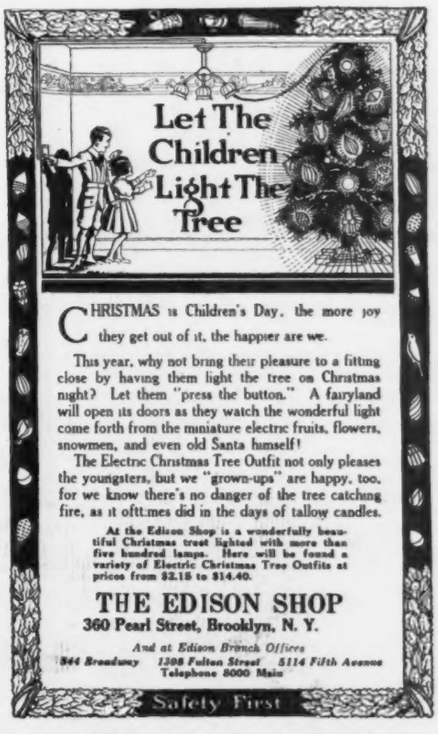
Show-Window Displays

In the show-window display the best opportunity of all is to be had, for there the gifts themselves can be seen. No printed description can quite equal the sight of the article itself. If the display is properly arranged and has the necessary setting, the devices appear even more attractive than usual. Displays can easily be made attractive at this time of the year because of the many decorative materials that are to be had. There are poinsettia, holly and mistletoe, laurel, Christmas bells, stars, and wreaths in white, green and red, the Christmas colors. A display need not be elaborate to be effective; in fact, a simple arrangement of merchandise with a little touch of color given by a wreath, a few bells, holly spray and roping will frequently be found to produce better selling results than a complicated mechanical display. Motion in a display will attract attention, but the rest of the display, the merchandise, must be closely linked with the mechanical attraction if the whole is to succeed as a sales producer. The show window's function is to sell goods, and this should not be lost sight of in an endeavor to produce some startling mechanical effect. The lighting of the window must be

CARD FOR SHOW WINDOW

especially intensive for nearly every merchant in order to compete with the other merchants who have "brightened up" for the occasion. Care should be taken that there be no light to dazzle and blind the eye so that the merchandise cannot be seen.

Displays should be changed on an average once each week, as the majority of the people will pass a store within a week's time. Even though the same devices are used, a change of arrangement should be made to give a different appearance. It is the constant change that makes the passer watch show windows in order to see what is new. Show cards embellished with a spray


Let The Children Light The Tree
CHRISTMAS is Children's Day, the more joy they get out of it, the happier are we.
This year, why not bring their pleasure to a fitting close by having them light the tree on Christmas night? Let them "press the button." A fairyland will open its doors as they watch the wonderful light come forth from the miniature electric fruits, flowers, snowmen, and even old Santa himself!
The Electric Christmas Tree Outfit not only pleases the youngsters, but we "grown-ups" are happy, too, for we know there's no danger of the tree catching fire, as it oftimes did in the days of tallow candles.
At the Edison Shop is a wonderfully beautiful Christmas tree lighted with more than five hundred lamps. Here will be found a variety of Electric Christmas Tree Outfits at prices from $2.15 to $14.40.
THE EDISON SHOP
360 Pearl Street, Brooklyn, N. Y.
And at Edison Branch Offices
544 Broadway 1308 Fulton Street 5114 Fifth Avenue
Telephone 8000 Main
Safety First

APPEALING CHRISTMAS ADVERTISEMENT WITH MORAL

of holly, a cut-out figure of Santa Claus, etc., should be used with the displays.

Interior Decorations

The store interior should be so arranged that a visitor cannot turn around without seeing some reminder of

Santa Claus. There are many people who will visit the store to make everyday purchases without any thought that Christmas is so near. The show cards and decorations should give them no chance to forget that they have their Christmas shopping to do.

The decorations make the customer more cheerful, and a cheerful shopper is a good buyer. The same kinds of materials are available that may be had for the window displays. Holly paper can be had to cover the floor and shelves of showcases, and a bright red crêpe-paper bow adds life to a display. Interior displays and stocks should be made to appear full, so as to make the customer feel that he has plenty to choose from. Reserve stock should be brought to the salesroom that there may be a big show of appliances to impress this idea on the purchaser. It is surprising to see what articles can be sold as gifts if placed where they can be seen.

Value of Courtesy

Getting a customer into the store is but half the battle; treating him right after he is in completes the conquest. Courtesy to customers is a commodity that is never cheapened by over-supply. No matter how

BOOK OF GIFT SUGGESTIONS ISSUED BY N. E. L. A.

excellent goods may be or how cleverly advertised, a careless, incompetent sales force can drive away far more trade than advertising and display can bring.

One of the critical points in retail selling is that of promptness in serving customers. People dislike to wait, and when a man has money to spend he wants prompt attention, and is entitled to it.

Another detail that makes for good will is the manner in which packages are done up. This may seem a small thing, but it counts greatly at Christmas time. Every package that leaves the store during December should carry with it some little symbol suggestive of the season. This applies particularly to small packages containing gifts. What are known as "holly boxes" are not expensive and add much to the attractiveness of the gift. For tying them holly tape or narrow red ribbon should be used, and to large packages a holly poster should be affixed.

Keeping delivery promises and a courteous delivery man will carry the sale to a satisfactory conclusion. Not all of these improvements can be accomplished at once, but any one of them will do its share toward putting the balance on the right side of the ledger.

WHAT SHALL IT BE?

Timely Suggestions of Christmas Gifts Suitable for the Whole Family—Opportunities for Electric Shops

BY H. W. ALEXANDER*

The season of the loosened pursestring is here. Millions of people are asking, "What shall the Christmas gift be?" These people are swarming through the big stores looking for something to buy. They are scanning the magazines for gift suggestions. They are eagerly searching the newspapers for ideas of what to buy for dad, mother, sister, brother, sweetheart and the baby. And the sidewalks are crowded with a swelling army of "window shoppers" who are trusting to luck that the clever display men will suggest something different.

There is a growing desire for more sensible Christmas gifts. Here is where the live central-station men and the electrical supply dealers step into view. With an "Electrical Christmas" as a slogan and a vast throng to sell to, the dealer should lay his sales plans determined that at least a portion of the money to be spent shall flow his way.

Electrical Gifts Practical

And, really, why shouldn't it? There are no more practical gifts than electrical gifts. The general line of handsome electric heating and cooking devices represents a class of products of unequaled suitability as gifts for the whole family. Imagine how many a man would rather receive an electric shaving mug than a necktie he wouldn't wear. Certainly most women would rather be presented with a useful electric iron than gloves too large or too small. And the actual differences in costs are not enough to scare away the prospective buyer.

What would please grandma more than an electric teakettle? The boy at college would find considerable use for an electric radiator to take the chill off after the rub-down. The bachelor maid has frequent use for an electric grill. Unless it is something that can be enjoyed, a Christmas gift is a mere waste of money. Most people would much rather receive a post card of remembrance than something disappointing. Everyone, even the baby with its toys, can be pleased with a "gift electrical"—for it is a practical present that never loses interest or value.

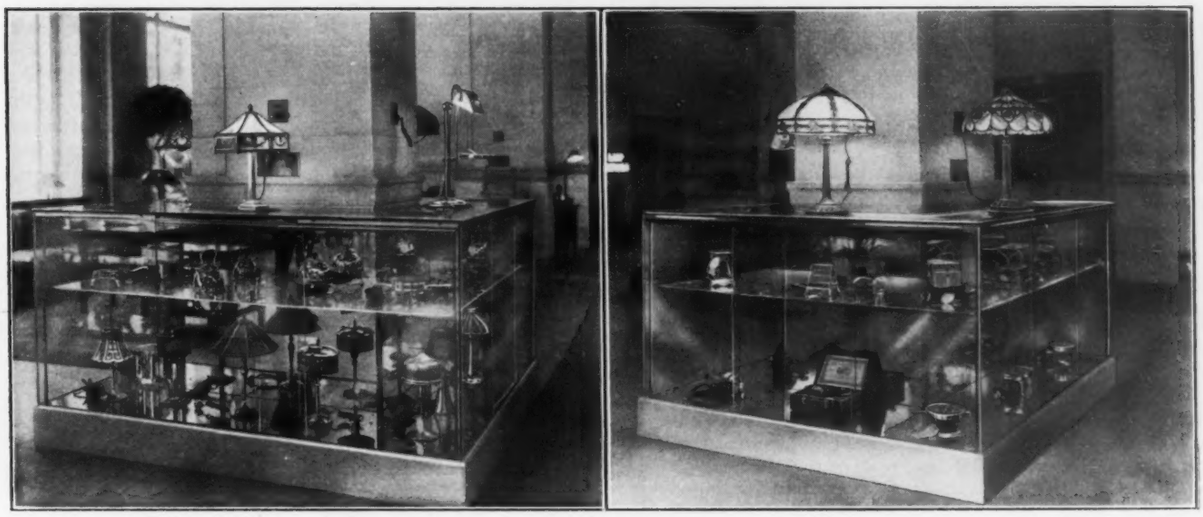
Household Electrical Devices

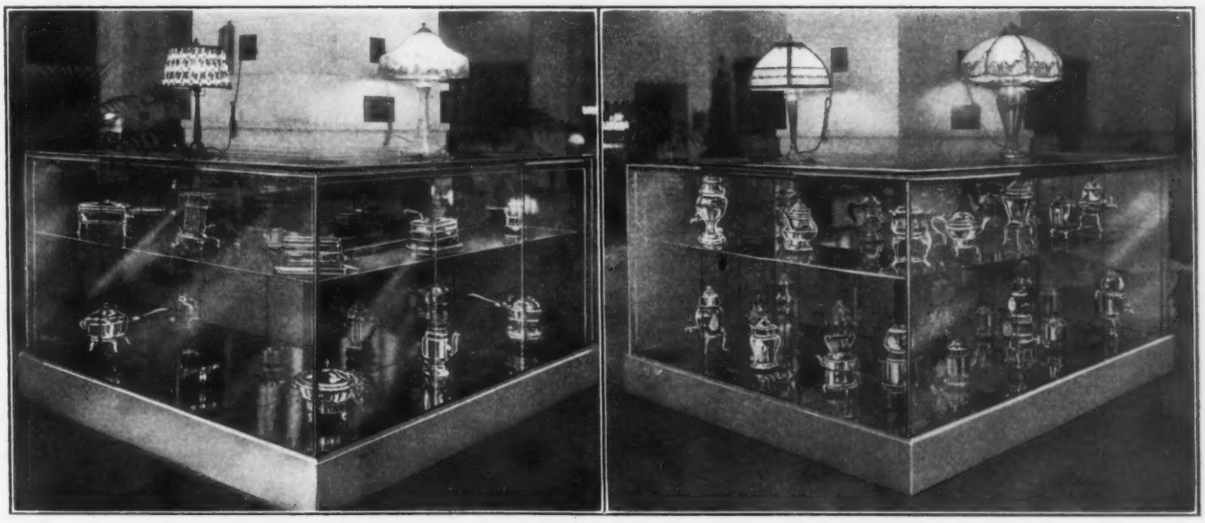
For the housewife there is the greatest assortment of all to choose from. For her it is but a question of "What shall I buy first?" Undoubtedly the electric iron stands among the real leaders of the gifts for her. The greater part of the drudgery of ironing day is banished when the electric iron is used. Hot, stuffy kitchens and the constant tramp, tramp, tramp between the kitchen range and the ironing board, carrying in the aggregate tons of steel and iron, are unnecessary. All such labor vanishes on the advent of the electric iron.

Then, too, consider the convenience afforded users of one of these labor savers. When rain takes the fluffiness out of the frocks and the little frills and ruffles which surround a woman, or when it takes the crease out of a man's trousers, it is necessary only to attach an electric iron to a nearby lamp socket, smooth out the wrinkles and everything is in proper shape again. Indeed, an electric iron should be right at the top of the gift list for the housewife, unless something else electrical is considered more important.

Next consider the electric percolator. It takes an electric percolator to make "real" coffee. And, too, it saves money, for by using this modern device it is pos-

*Publicity and sales manager Federal Light & Traction Company.





ELECTRIC DEVICES SUITABLE FOR CHRISTMAS GIFTS DISPLAYED BY THE NEW YORK EDISON COMPANY

sible to cut one-third off the coffee bill. It takes only eight minutes to make five cups of delicious coffee. Costs less than a cent for the electricity. And handsome percolators sell for $5 and upward. What better sales argument could anyone want?

LAMP

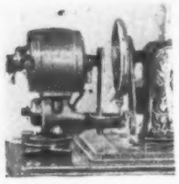
Winter is here. Almost any evening unexpected company is likely to call. What then? For the wife to start a fire and fuss around to prepare a bit of evening lunch, if only a "snack," takes time, causes trouble and possibly spoils an otherwise enjoyable evening for her. She has to leave the parlor; "hubby" must entertain the guests alone. And there is no end of muss. But when an electric grill is in the house things are different. She can fix up a bit of chicken, prepare a little toast, or cook many other tidbits on the "parlor range," right in front of the assembled guests. It is considered quite proper. The guests will enjoy the evening as much as the good wife. Such successful evenings in modern homes go far toward educating non-users of electrical appliances in the manifold advantages of utilizing the "little electric servants."

The convenience of using an electric grill does not stop with evening parties. For the breakfast an electric grill is most handy. It is possible to fry eggs, fix up what is left over from the night before, cook a bit of steak, and prepare any number of edible things. An electric grill will do almost anything that a big stove will do, except bake, so why not consider a grill as the "next buy"?

VACUUM CLEANER

Before passing evening parties entirely it is well to remember that an electric chafing dish is quite "the" thing for Welsh rabbits. Such an appliance will make a most acceptable gift for any woman.

When there is a baby in the house and the little one wakes up in the night, there is no need of "taking a chance" of catching cold, running around the house barefooted, when it is possible to use an electric milk warmer and heat the milk at the bedside. Many an otherwise sleepless night will be saved if a bottle of milk is kept at the bedside; when baby cries "twitch the switch," and in a jiffy hot milk is ready for the wee one.



SEWING MACHINE

Electrical Men Should Use Electrical Appliances

It may seem strange, but there are any number of workers in different branches of the electric industry who know little or nothing about such electrical devices as those mentioned in the foregoing. They have paid little attention to the progress in the development of these appliances; many haven't one electrical appliance in their home. If these men of the industry would only become interested and learn of the multifold advantages of utilizing the splendid devices, this vast army of electrical workers would most wonderfully assist the sales by educating "outsiders" and by showing their belief in the devices by purchasing them themselves. It would be of mutual benefit to all concerned—the manufacturers, the dealers, the workers and the public.

COOKING UTENSILS

Think of the number of electrical men who have not considered the handiness of the electric toaster. It will make piping hot, golden, nut-brown toast right at the table. No need of the housewife absenting herself from the dining-room while the head of the house dines alone. A united family breakfast is made possible by an electric toaster and other appropriate electrical cooking devices.

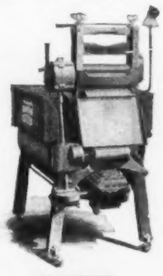
RADIATOR

Appliances for the Boudoir

Leaving cooking appliances to consider, for the moment, other "gifts electrical," there are such devices as electric curling irons, vibrators, hair driers, etc., which will always be appreciated by women. A heating pad for cold nights, for the aches and pains that come with winter, will be of good use to any member of the family. They make most suitable gifts. Such an improved device will do away with the old-fashioned hot-water bag with its many faults.

Gifts That Contribute Atmosphere to the Home

To get that "comfy" appearance about the home nothing lends so much enchantment as an artistic table lamp. No matter how simple or elaborate the home, there is always a place in it for additional lamps, and to-day, with so many homes wired, the electric lamp is a logical gift for the whole family.



WASHER

A hanging lamp for the dining-room, a bedside or chair-side lamp for those who indulge in the habit of reading in bed—these always make charming gifts. When in doubt about other things electrical, you cannot go wrong if you give an artistic electric lamp.

Unfortunately for them, there are many persons who cannot use electrical devices for the very good reason that they haven't electricity in their home. Of all modern conveniences the greatest is electric light. Certainly, a most satisfactory Christmas present for the whole family would be to wire the house for complete electric service. It will then be possible to use any number of "little electric servants" to make housework easier.

ELECTRIC STOVE

Gifts That Lighten Household Burdens

Now come the larger-sized electrical devices. In the up-to-date list of Christmas gift suggestions perhaps no more valuable device can be mentioned than the electric washing machine. Sometimes the central-station salesman will say, "Not enough energy consumption for us to bother with selling it." But stop! Is this a true statement of facts? Decidedly not. A washing machine will never be relegated to the corner of forgotten things, for the novelty will not wear off; it will always be useful and will be used. Fifty-two weeks a year is the average use of an electric washing machine.

ELECTRIC IRON

Household experts admit the washing machine to be one of the greatest labor savers of all electrical appliances intended for women. It stands as a leader alongside the electric iron. The use of an electrical washer will probably go farther toward stimulating interest in the residential use of electric service than any other energy-consuming device sold.

Those in a position to know say that an electrical washing machine in the neighborhood will be of more advertising value to the central station and to the dealers than many hundreds of dollars spent in publications. A woman can see with her own eyes just what it will do. She will show her neighbors. The machine actually sells itself.

ELECTRIC TOASTER

There is another useful member of the "big" electric family. It is the vacuum cleaner. Like the washing machine and iron it frees woman from hours of back-breaking labor, which she can easily devote to resting that she may retain her health and youthful beauty long after her children grow up.

Give a woman an electric vacuum cleaner and her home will be freer from dust and from germs; it will be better, sweeter, more healthful in every respect than ever before. It will be truly home.

It is said that 30,000 stitches can be made for one cent when the electric-sewing-machine motor puts an end to pedaling and backaches. And they are not expensive to buy. It is certainly a great boost for electricity to get a sewing-machine motor in the household.

Now about electric ranges. All housewives would much prefer electric ranges for cooking if it were not for the supposedly high cost of operation. Many cities offer exceptionally low rates for electric cooking, in which event an electric range would be a most appropriate gift. They are being reduced in price every day. Where rates are 3 cents and 4 cents per kw-hr. it is not impossible to sell a number of electric ranges at Christmas time.

Gifts Suitable for Men

There is a present which will be most welcome to the man of the house. Make his little den cozier by getting for him an electric radiator. At the home or in the office a "modern fireplace" will bring good cheer and warmth. For the old folks whose hair is silvery and whose bodies need warmth there is nothing more pleasing to give than an electric radiator. It is ever ready to chase away chills and colds. An electric radiator—with its glowing, cheerful light—is a gift for man, woman or child.

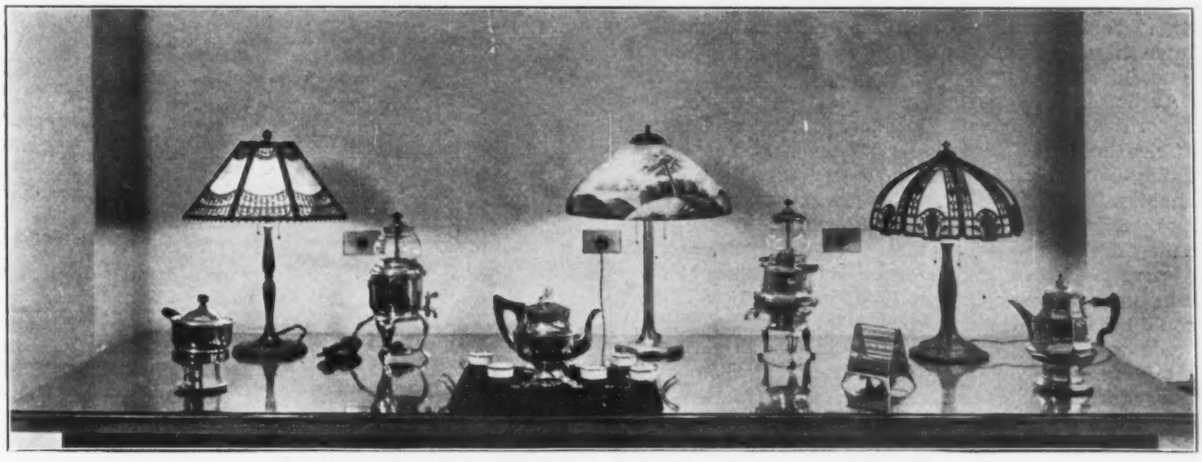
For the men, too, are electric cigar lighters, shaving mirrors, shaving mugs, etc., any one of which will be most acceptable.

And so on down through the long list of suggestions for gifts electrical that please one might go, naming the big sales points of each device, what they will do, how they will save, how they will benefit the purchaser. Those who do it electrically will profit in many ways every day of their lives.

There is a point well worth remembering in marketing electric heating and cooking devices; that is, although present energy consumers fully realize the convenience of such devices and the cleanliness they afford, they are somewhat skeptical in many instances as to the economy. It is this doubt that has prevented the wholesale equipping of American homes with the wonderful labor savers. When selling appliances every care should be taken to explain the moderate costs of using the devices, and in advertising the economy should always occupy prominent space in the argument.

Children's Electrical Toys

Now for the children. Modern electric Christmas trees will be lighted with tiny electric lamps of many colors, completely eliminating the fire risk of the old-fashioned days when so many holidays were spoiled by disasters due to fires caused by lighting trees with candles.



PORTABLE ELECTRIC LAMPS MAKE USEFUL AND ATTRACTIVE GIFTS

To fill these Christmas trees there are any number of electrical toys which will bring delight to the heart of the boy or girl. And this year more than ever before should be most opportune to sell electrical toys.

HEATING PAD

Here are some good reasons for this assertion. Germany has for many years led the world as a maker of toys, exporting $15,000,000 worth of all kinds of playthings a year. France has been second, with $7,500,000. This country is the largest purchaser of toys. Last year the United States imported 12,000,000 toys and dolls and spent $30,000,000 for foreign and home-made playthings.

Isn't this a good reason for the supply dealer stocking up and pushing electric toys, such as electrically operated trolley cars, toy motors and generators, trains, etc.? Europe cannot supply them. United States manufacturers will. The demand has been created. It is but a question of pushing the sale.

Electrical Devices Necessary

Progressive women consider electrical devices absolutely necessary in the home. But, at the same time, arguments are advanced that electrical goods are higher priced than corresponding articles which serve the same purposes but are not electrical. True enough. So it is cheaper to walk down town than to take the electric car. But which is more convenient? Which is really cheaper in the long run? And, compared to the old-fashioned sadiron with its penalty of backaches, isn't the more expensive electric iron actually cheaper for the woman? And the same comparison applies to the broom and the vacuum cleaner, and so on.

This is the opportune season of the year in which to sell electrical goods. Already the first rivulets of that great flood of stored-up Christmas wealth are beginning to appear. Money is even now flowing into the coffers of the enterprising merchants and manufacturers. Some say not so much as in former years. Possibly this is true, but this year more than any other recent year much money will be spent for practical "made in America" gifts, and electrical goods stand pre-eminent as useful gifts for everyone.

Authorities say that 90 per cent of the annual sales of "ordinary" percolators, chafing dishes and similar articles occur at this time of the year. The holiday chafing-dish sales alone amount to ten to every thousand inhabitants. Why not make a major portion of these sales "electrical," instead of allowing the "ordinary" chafing dishes and percolators to preponderate?

There is but one answer to all the foregoing. Everything in the household that it is possible to modernize should be electrified. Everyone in the electrical industry should willingly co-operate to that splendid conclusion, that this nation-wide "do it electrically" movement may be wonderfully successful. It is the individual worker in the great army of employees of manufacturing concerns, central stations, dealers, jobbers and contractors that should put his shoulder to the wheel to electrify the industries and modernize the homes of the nation.

Christmas is an opportune time to "make good" the resolutions of assistance. To show their good faith in the "do-it-electrically, buy-a-practical-present" movement workers in the industry should urge their friends to purchase Christmas gifts electrical; they should themselves buy electrical gifts to show that they believe in their assertions and in their labors. By so doing all

Beautiful Electric Giftware
THE permanent usefulness of Electric Giftware is no better illustrated than in this season's holiday models of Electric Portable Lamps on exhibition and sale at the Edison Shop. All are moderately priced, several types of bedroom lamps selling as low as $2.25
The gift of an Electric Library or Table Lamp expresses the real Christmas spirit. It brings to the home the soft, cheerful brilliance of a perfect illumination combined with wonderful decorative possibilities—A gift that will be appreciated and used for many years to come.
The display at the Shop includes Library Lamps, Desk Lamps, Piano Lamps, Student Lamps, Boudoir Lamps, Table Lamps. Prices $2.25 to $100.
THE EDISON SHOP
360 Pearl St, Brooklyn, N.Y.

CHRISTMAS-LAMP ADVERTISEMENT OF BROOKLYN EDISON COMPANY

will profit—the dealer, the contractor, the jobber, the manufacturer and the central station—and here the pendulum will swing back to the employee, who profits most because of increased production. Let this be a glorious "electrical Christmas." To that praiseworthy, mutually beneficial end, an excellent slogan is: "Give something electrical, the best gift of all."

PORTABLE-LAMP DISPLAY OF NEW YORK EDISON COMPANY

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Busy Season for Flashlamps.—The American Ever Ready Works, 304 Hudson Street, New York, are very busy at present. This concern has recently placed on the market a vest-pocket flashlamp which opens like a cigarette case, a colored toy lantern, a special house lamp and a nickel-plated tubular flashlamp. The demand for flashlamps, it is said, is largest in the autumn.

Useful Christmas Gifts.—Mr. J. F. Hemenway, of the Smith & Hemenway Company, 150 Chambers Street, New York, manufacturer of tools, declares that on account of the supposedly hard times people will more seriously consider useful gifts for Christmas presents this year than ever before. The above company is sending out to dealers easels with various tools, such as pliers, attached to them to suggest to the trade the suitability of tools as Christmas gifts.

Supply Company's Christmas Campaign.—The Manhattan Electrical Supply Company, 17 Park Place, New York, has issued a catalog which contains information on electrical devices suitable for Christmas presents. These catalogs are being sent to a large number of possible purchasers through its branch stores in New York, Chicago, St. Louis and San Francisco. The business of this company is very good at present, and prospects for an active holiday campaign, especially in reference to its battery-operated devices, are good.

Heating Company's Holiday Preparations.—Since Oct. 1 the Hotpoint Electric Heating Company's stationery has had a holly-leaf border on it, and at the bottom of each sheet is the caption "Let's all join hands and make it a 'Hotpoint' Christmas." Folders listing various types of heating appliances are being sent out to dealers. The dealers' imprints are put on these folders if desired. Special invitation letters, containing gift suggestions, lantern slides and directions for making window displays, are also being supplied to dealers.

Electric Time Recorder.—Automatic electric apparatus for recording the time of arrival and departure of workmen has been developed by the Stromberg Electric Company, Chicago, Ill. The system is operated by a master clock which is self-winding and which sends electrical impulses to the secondary apparatus, such as secondary clocks, cost-keeping recorders, employees' time recorders, time stamps or program machines. An order has recently been received by the above concern from the Crane Company, Chicago, Ill., for forty employees' recorders, forty-six secondary clocks and a large tower clock.

Business in Small Motors Good.—The Fort Wayne Electric Works of the General Electric Company are receiving orders for a large number of fractional horse-power motors. These motors are used chiefly with washing machines, vacuum cleaners, etc. It is said that 70 per cent of the electric washers made in this country are operated by motors made by the above concern. During the past calendar year, it is reported, over 100,000 small motors were manufactured by the Fort Wayne Electric Works. Apparatus for use with motion-picture machines made by the Fort Wayne Electric Works is also being used to a considerable extent.

Orders for Generating Equipment.—Escher, Wyss & Company, of Montreal, Canada, have been awarded the contract for two 2250-hp waterwheels, with accessories, by the Hydro-Electric Power Commission of Ontario, for the new hydro-electric generating station at Eugenia Falls. Under a head of 540 ft. these wheels run at a speed of 900 r.p.m. The above company has also received the contract for a 12,000-kw turbo-generator set for the city of Leeds, England. This contract had previously been awarded to a German firm, but after the war it was given to Escher, Wyss & Company. A Siemens three-phase, fifty-cycle, 6750-volt generator will be used. The speed of the set will be 1500 r.p.m.

Remote-Control Switches.—The A. G. Electric & Manufacturing Company, Seattle, Wash., is making a remote-control switch which is designed for service in cities where ordinances require that there be means for opening the electric circuit in a building near the main entrance. The switch is operated by a spring and opened through a coil which is controlled by a push-button switch near the entrance of the building. Recently the above company made a switchboard with seven of these switches mounted on it for the Electric Construction Company, San Francisco, and also two 800-amp, three-pole switches and one 600-amp switch of the same type for the National Electric Company, San Francisco. The latter order was for the Gaiety Theater in San Francisco. The switches control three service lines and are operated from one push-button switch in the entrance of the theater. The A. G. Electric & Manufacturing Company has recently been very busy.

Radial-Flow Reaction Steam Turbines.—In the *Electrical World* of Nov. 29, 1913, was described a radial-flow steam turbine of the reaction type designed by Messrs. Birger Ljungström and Fredrick Ljungström of Stockholm, Sweden, and manufactured by the Brush Electrical Engineering Company, London, England. This turbine is manufactured in Sweden by the Svenska Turbinfabriks Aktiebolaget Ljungström, the works of which are at Finspong, Sweden. The Swedish company was founded early in 1913 and has obtained the patent rights for manufacturing the machine in the Scandinavian countries and in Russia and Finland. The company is also manufacturing turbo-generator sets in connection with the steam turbines. Economy in steam consumption and comparatively small weight and dimensions are claimed for this type of turbine. The Swedish company is now building a 10,000-hp turbo-generator set for the Willesden power station in London, which will be an addition to a 1500-hp set installed in the station in 1913. A 1000-hp set for propelling a Swedish passenger ship has just been completed and another marine set rated at 1100 hp is being built for William Beardmore & Company of Glasgow, Scotland. The total rating of Ljungström turbines now installed or being constructed amounts to about 60,000 hp.

Orders for Electrical Equipment.—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has recently received orders for the following apparatus: Two 300-kw rotary converters; two 300-kva transformers and one six-panel switchboard, Ithaca Traction Corporation, Ithaca, N. Y.; two 300-kw rotary converters and one five-panel switchboard, Cleveland, Youngstown & Eastern Railroad, Cleveland, Ohio; three 185-kva transformers, Cleveland & Eastern Traction Company, Cleveland, Ohio; one 400-kw rotary converter, three 125-kva transformers and one three-panel switchboard, Standard Electric Construction Company (Johnson & Company, Inc.), New Orleans, La.; one 300-kw motor-generator set, and one five-panel switchboard, Sioux City Service Company, Sioux City, Ia.; one 100-kw direct-current generator, Tunbridge Realty Company (Hotel St. George), Brooklyn, N. Y.; one 250-kw direct-current generator, Jacob Epstein (Baltimore Bargain House), Baltimore, Md.; two 20,000-kw steam turbo-generator units, two 200-kw motor-generator sets, three 5500-kva transformers, three 1000-kva transformers, three 5000-kva transformers, three 1000-kva transformers and one thirteen-panel switchboard, United Electric Light & Power Company, New York City; two 150-kw rotary converters, two 165-kva transformers and one three-panel switchboard, Wilmington & Philadelphia Traction Company, Wilmington, Del.

Corporate and Financial

Philadelphia Company Dividend Scrip.—The Philadelphia Stock Exchange announces that the dividend scrip of the Philadelphia Company, issued on Nov. 2, has been admitted to the unlisted department.

Unusual Utility Investments Made Possible by War.—William P. Bonbright & Company, of New York, in recommending the purchase of electric-utility bonds said: "The war has made possible unusual investments in the bonds and preferred stocks of public utilities in this country, but it has not decreased their earnings."

Commonwealth Power, Railway & Light.—Mr. D. E. Pomeroy, vice-president of the Bankers' Trust Company, has been elected a director of the Commonwealth Power, Railway & Light Company to succeed Mr. Benjamin Strong, Jr., who resigned to take his place as governor of the Federal Reserve Bank of New York.

United Light & Railways.—The United Light & Railways Company, Grand Rapids, Mich., has compiled a chart showing the intercorporate relations of the company and its subsidiaries as of June 30, 1914. The total outstanding capitalization was $24,655,000. Of the $220,000 of 6 per cent notes due Jan. 1, 1915, $100,000 have been retired. These notes were in part payment of properties purchased.

Byllesby Sees Improvement.—Mr. H. M. Byllesby, upon returning to Chicago after a trip to the Pacific Coast, said: "After a three weeks' absence I find a decided improvement in the demand for investment securities. Purchasing orders received for bonds, coupon notes and preferred stocks are gratifyingly large in volume compared with the market for three and one-half months past. This indicates not only that considerable amounts of capital in the United States are awaiting investment, but returning confidence in our immediate commercial future."

A War-Time Investment.—Mr. Albert H. Bickmore, of A. H. Bickmore & Company, New York, in speaking of the merits of lighting-company securities as a war-time investment, said: "Lighting companies are but little affected by general business conditions. In previous periods of depression the gross and net earnings of most lighting companies increased somewhat while nearly every other class of public or private business experienced a decreased income. Lighting companies are the one great class of enterprises that can be relied upon to maintain at least present earnings."

Kentucky Utilities First Mortgage Bonds.—A. H. Bickmore & Company, of New York, are offering $564,000 of first mortgage five-year 6 per cent gold bonds of the Kentucky Utilities Company, dated Oct. 15, 1914, at 95.84, to yield 7 per cent. The authorized issue is $3,000,000, of which $1,500,000 is outstanding. The remaining bonds will be offered later at a higher price. The proceeds from the bonds have been used in paying for some properties acquired and to reimburse partially the treasury for improvements. The outstanding capital stock of the company is owned or controlled by the Middle West Utilities Company.

Consolidated Gas $25,000,000 Bond Issue.—The Public Service Commission of the First District of New York has authorized the Consolidated Gas Company of New York to issue $25,000,000 convertible debenture bonds and $25,000,000 additional common stock to replace such debentures, provided no legal difficulties result from a previous issue of debentures of the company. The bonds are to replace money used to acquire the New York Edison Company and the Astoria Light, Heat & Power Company, to discharge $5,000,000 of eight-month collateral trust notes and to discharge demand notes issued in 1906 and 1907 for $2,500,000.

Baltimore Company's Exchange of Stock.—The Consolidated Gas, Electric Light & Power Company, of Baltimore, has notified preferred stockholders that the offer of the company to exchange, share for share, 7 per cent common stock for 6 per cent preferred stock, which expires on Dec. 19, 1914, calls for the deposit of preferred shares on or before that date. The preferred shares so deposited will rank with the existing common stock for the dividend accruing for the quarter ending Dec. 31, 1914, thereby giving the preferred shareholders making the exchange the advantage of one-fourth of 1 per cent additional income for the quarter. The *Electrical World* of Aug. 22, 1914, contained an account of the plan in which the former time limit of Sept. 19 was given.

Massillon Electric & Gas Notes.—The Massillon (Ohio) Electric & Gas Company is offering at 99, to yield 7 per cent, a $75,000 issue of one-year 6 per cent collateral-trust notes. The notes are to be dated as sold and interest is payable six months thereafter and at maturity. The notes are issued under a trust indenture dated Oct. 19, 1914, which provides for the deposit with the trustee of the first mortgage 5 per cent sinking-fund gold bonds of the Massillon Electric & Gas Company, on the basis of 150 per cent in bonds of the total amount of notes issued. The purpose of this issue of notes is to provide a part of the funds required for increased plant and equipment to supply power to the Central Steel Company, and the American Stamping & Enameling Works, whose plants are now building, and to supply additional power to the Massillon Rolling Mills, the plant of which is now being enlarged. The Massillon Electric & Gas Company has contracted with these companies to supply 3000 hp, beginning Jan. 1, 1915, and the additions to its plant and equipment to care for this new business will require the investment of approximately $100,000.

Southern Power Company Bond Offering.—Perry, Coffin & Burr of Boston, Harris, Forbes & Company of New York and the National City Bank of New York are offering at 97 and interest $800,000 of first mortgage 5 per cent gold bonds of the Southern Power Company of North and South Carolina. The bonds are twenty-year bonds dated March 5, 1910. The company was incorporated in 1905 and is capitalized for $10,000,000 in stock and $5,800,000 in funded debt. The earnings for the year ended Sept. 30, 1914, showed a balance, after deducting operating expenses, taxes and rentals and annual bond interest, of $1,107,663. The company served a region in which there are 420 mills, having an estimated equipment of 6,000,000 spindles and 125,000 looms. The bond issue is secured by the first and only mortgage upon the company's hydroelectric development, aggregating 118,000 hp, on steam development, aggregating 44,000 hp, and on the company's system of high-tension transmission lines and distributing systems. The authorized issue is $10,000,000, of which $5,800,000 is outstanding, the remaining $4,200,000 bonds in escrow to be issued for 70 per cent of the cash cost of additions and extensions to the property, provided that the net earnings for the preceding twelve months shall equal at least twice the annual interest on all first mortgage bonds outstanding, including those supposed to be issued. The company is controlled by Messrs. J. B. Duke, B. N. Duke, R. H. Wylie, W. G. Wylie and W. S. Lee and associates.

Brady Estate Includes Larke Utility Holdings.—The estate of the late Anthony N. Brady, as shown by the appraisal filed in the New York State Controller's office, was $77,042,443. Among the many holdings were 22,029 shares of the Brooklyn Rapid Transit Company, valued at $1,935,798; 3960.8 shares of Commonwealth Edison Company, valued at $566,304; 9200 shares of Consolidated Gas Company of New York, $1,205,200; 6501.6 shares Consolidated Gas, Electric Light & Power Company of Baltimore (preferred), $650,160; 5439.2 shares of Consolidated Gas, Electric Light & Power Company of Baltimore (common), $516,724; 4803.2 shares Dayton Power & Light Company (preferred), $336,224; 10,324.8 shares Dayton Power & Light Company (common), $103,248; 9614 shares Electric Storage Battery Company (common), $432,630; 36,185 shares Kings County Electric Light & Power Company, $3,799,425; 6989 voting trust certificates Kings County Power Company, $384,395; 14,150 shares Memphis Consolidated Gas & Electric Company, $920,400; 6240 shares Merchants' Power Company, $405,600; 3667 shares Municipal Gas Company, $1,081,765; 11,200 shares Utica Gas & Electric Company, $1,680,000; Kings County Electric Light & Power Company convertible 6 per cent bonds and interest, $698,133; Memphis Consolidated Gas & Electric Company 5 per cent bonds and interest, $791,059. The appraisal of the Brady estate brought out an interesting side of Mr. Brady's character. At the cost of $6,000,000 he kept his word and continued the work on the Chattanooga & Tennessee River Power Company. When finished the plant will not be worth more than $2,500,000, the original estimate being less than $1,000,000.

ATLANTIC UTILITIES REPORT GAINS

September Operations of Central Stations in Atlantic States Show Increase Over Previous Year

The returns received by the *Electrical World* from over 70 per cent of the central-station industry of the Atlantic States for September show that the utilities were ahead of 1913 both in gross income from energy sales and in energy output. September was worse than August for this territory. Almost every industry with the exception of the electric utilities experienced a curtailment in some way. Some companies in large industrial centers experienced a slight decrease in output, but these were rare cases. The figures in Table I show that the companies have kept up their income growth and that the output increase is comfortably ahead of last year. Some large companies in the South, in anticipation of an industrial depression, have been devoting their efforts to building up a strong demand for high-priced energy. The success of their efforts is well seen in Table I. The figures in Table II showing the September operations of three large companies in the Middle Atlantic States, while they do not show as large percentage increase as in previous months, are exceptionally good. These companies sell the greater part of their energy in large industrial centers, which are always the first to feel any serious depressions. The competition of large cities causes such a small margin of profit that any stringency of money means a shutting down to save expenses.

Small Companies Do Well

Comparative figures have been made up of companies of different sizes, for convenience called large, medium and small. The large companies experienced a growth in income of 9.7 per cent in July, 7.5 per cent in August and 4.3 per cent in September. The output growths for the same three months were 9.7 per cent, 8.3 per cent and 2.8 per cent respectively. The medium-sized companies showed a growth in income of 10.7 per cent in July, 7.6 per cent in August and 8 per cent in September, and in output of 16 per cent in July, 15.7 per cent in August and 13.2 per cent in September. The small companies for the months of July, August and September showed income growths of 16.4 per cent, 18.7 per cent and 9.7 per cent and output growths of 9.3 per cent, 19 per cent and 13.4 per cent. Thus, so far as the effects of the war are concerned, the medium and small-sized companies have felt little or no effects. The larger companies, as above stated, owing to their environment, cannot be expected to grow as rapidly as under normal conditions. The significant fact is that these companies are growing.

The percentage growths by states for September, according to our figures, are: Pennsylvania, 7.2 per cent in income and 10.8 per cent in output; New Jersey, 8.6 per cent in income and 5.6 per cent in output; North Carolina, 11.2 per cent in income and a 3.4 per cent decrease in output; South Carolina, 19.3 per cent in income and 22.2 per cent in output; West Virginia, 9.3 per cent in income and 15.3 per cent in output; Florida, 16 per cent in income and 10 per cent in output; Virginia, 3.8 per cent in income and 3.2 per cent in output; Georgia, 17.7 per cent in income and 36.8 per cent in output; Maryland, 14.8 per cent in income and 13 per cent in output, and New York, 3 per cent in income, the output remaining the same.

TABLE I—RETURNS RECEIVED FROM CENTRAL STATIONS IN THE ATLANTIC STATES OVER AN EIGHT-MONTH PERIOD

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February (54 per cent of industry)	$7,288,792	$6,655,011	9.8	231,790,165	205,726,060	12.6
March (60 per cent of industry)	6,021,269	5,661,027	6.4	246,306,123	223,156,161	10.5
April (65 per cent of industry)	6,731,495	6,106,634	10.3	261,133,882	252,069,127	3.7
May (68 per cent of industry)	6,492,767	5,628,718	14.5	259,098,542	238,733,320	8.4
June (70 per cent of industry)	6,067,780	5,728,311	6.0	244,936,886	221,315,464	10.8
July (70 per cent of industry)	6,152,169	5,583,309	10.2	263,580,299	235,068,939	11.8
August (71 per cent of industry)	6,224,896	5,755,515	8.2	264,717,319	237,984,895	11.2
September (71 per cent of industry)	6,608,221	6,221,000	6.1	270,974,533	252,648,550	7.3

TABLE II—COMPARATIVE FIGURES SHOWING THE MONTHLY OPERATIONS OVER AN EIGHT-MONTH PERIOD OF THREE LARGE COMPANIES IN THE MIDDLE ATLANTIC STATES, REPRESENTING 35 PER CENT OF THE CENTRAL-STATION INDUSTRY OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February	$3,766,823	$3,497,948	7.8	112,892,266	108,302,262	4.2
March	3,492,149	3,386,190	3.1	118,897,901	114,136,574	4.2
April	3,437,634	3,104,160	7.6	112,894,803	105,328,705	7.2
May	3,113,526	2,476,781	28.2	108,171,896	104,267,718	3.8
June	2,952,454	2,844,643	3.7	103,013,271	97,628,941	5.7
July	2,933,019	2,648,625	10.8	106,607,151	97,459,526	9.5
August	2,906,057	2,692,408	8.0	107,656,963	100,753,254	6.8
September	3,083,956	3,003,008	2.8	109,732,933	108,123,057	1.5

Industrial Conditions

The industrial tone of the month, while decidedly full of optimism regarding the future, was nevertheless very conservative. In the Middle Atlantic States during the first week of the month several lines began to show an increased activity. Cloak and suit factories were busy. The anthracite coal mining was normal, but bituminous was quiet owing to unsettled prices. Cotton mills, while optimistic and expecting improvements in the near future, were for the most part on half time. The glove trade was affected by strike conditions. Iron and steel mills were running 60 per cent of normal output and cotton and knit-wear mills 75 per cent of normal output. The second week saw a tendency for betterment, but with slow progress. The manufacturers of clothing were fairly well engaged. The window-glass and coal trade were better, the latter being nearly normal. Paint manufactories were very busy. Pig-iron furnaces were operating 60 to 65 per cent normal capacity. In the third week there was little change, but an increasing confidence. The buying was cautious. The manufacturers of hosiery were busy, and those of waists and dresses were moderately busy. Iron and steel were slowly developing. The last week saw more activity in some lines, but generally little change. Clothing manufacture was falling off in all lines owing to one thing or another. Iron products were quiet.

In the South Atlantic States the tone of the month was conservative. In the first week manufacturing of clothing was quiet with many factories on half time. The second week was also quiet. Manufacturers were suffering from lack of raw material from Europe, dyes and an export market. The third week saw some change. There was a favorable market, but money was not plentiful. Most plants were running, even if not on full time. The fourth week saw conditions more improved. Machinery manufacture was active and clothing factories were doing well.

Business Notes

Ellsworth Haring, 684 Hancock Street, Brooklyn, N. Y., for sixteen years with Hermann Boker & Company, has organized an establishment for marketing tool-steel devices and various specialties.

The Jeffrey Manufacturing Company.—M. W. Sherwood has been appointed sales manager of the Jeffrey Manufacturing Company, Montreal, Quebec, and he succeeds H. W. Scott, who has resigned to establish himself in the engineering contracting business. Mr. Sherwood was formerly assistant sales manager of the above company.

Harrington, Howard & Ash, Kansas City, Mo., a firm of consulting engineers recently formed, will be engaged in hydroelectric developments, municipal work, etc. J. L. Harrington has been associated for eight years with Waddell & Harrington, a firm of consulting engineers which has recently been dissolved. E. E. Howard has been connected with the latter concern, and L. R. Ash has been city engineer for Kansas City.

New Industrial Companies

The Continental Electric Welding Company, of New York, N. Y., has been incorporated with a capital stock of $20,000 by Hugo Tessensohn, William Steiger and Heidrich L. J. Siemund, all of 29 Broadway, New York, N. Y.

The Learned-Tompkins Electric Company, of Boston, Mass., has been chartered with a capital stock of $50,000 by A. W. Learned, Clarence G. Tompkins and William B. Phipps. The company intends to manufacture and deal in electrical apparatus.

The Funk & Grupe Company, of Hoboken, N. J., has been incorporated with a capital stock of $50,000 for the purpose of manufacturing electrical appliances, manufacturers' and mill supplies. The incorporators are N. E. Funk, W. F. Grupe and E. Jrlison, of Hoboken, N. J.

The S. I. L. Electrical Company, of New York, N. Y., has been incorporated by G. H. Mallory, H. T. Lilliendahl and F. C. Duey, of New York, N. Y. The company is capitalized at $250,000 and purposes to manufacture electrical devices and machinery and self-starters, igniters and lighters in connection with internal combustion.

Trade Publications

Cut-out Boxes.—The Western Electric Company, New York, has issued a folder listing various types of cut-out boxes.

Electric Washer.—A dolly-type electric washing machine is described in a folder sent out by the Altorfer Brothers Company, Roanoke, Ill.

Lamp Cord.—Various kinds of lamp cord are listed in Booklet No. B-3317 issued by the General Electric Company, Schenectady, N. Y.

Insulated Canopy.—A recently developed insulated canopy is described and illustrated in a leaflet issued by the F. W. Wakefield Brass Company, Vermilion, Ohio.

Electric Iron.—A leaflet recently published by the Menominee Electric Manufacturing Company, Menominee, Mich., contains a description of a 6-lb. electric iron.

Electric Time-Recording Machines.—The Stromberg Electric Company, Chicago, Ill., has issued a catalog which describes and illustrates electrically operated time-recording machines.

Electric Vehicle Battery-Charging System.—The Klingelsmith Electric Truck Company, 79 West Monroe Street, Chicago, Ill., has issued a catalog describing its "multi-battery" system for electric vehicles.

Effect of Illumination on the Eye.—"Light and Your Eyes" is the title of a treatise on the effect of illumination on the eyes which has just been issued by the Cooper Hewitt Electric Company, Hoboken, N. J. "What Users of Cooper Hewitt Light Say About It" is the subject of a folder also published by the above company.

Dashboard Lamp.—An automobile electric dashboard lamp is described in a leaflet put out by the L. A. Williamson Company, New York.

Fixture Studs.—Stamped-steel fixture studs are the subject of a leaflet recently published by the National Metal Molding Company, Pittsburgh, Pa.

Kerosene Torch.—A lineman's kerosene torch is described in a leaflet issued by the Hauck Manufacturing Company, 140 Livingston Street, Brooklyn, N. Y.

Paint.—The Dielectric Manufacturing Company, Chicago, Ill., recently issued Bulletin No. 2, which describes a paint called "graphon," used to protect metallic surfaces.

Barbed Anchor.—The construction and advantages of a barbed anchor are given in a pamphlet prepared by the Barbed Anchor Manufacturing Company, Louisville, Ky.

Material for Technical Magazines.—Walter B. Snow, 136 Federal Street, Boston, Mass., has issued a folder listing various kinds of material supplied to technical magazines.

Portable Lamps.—The Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, Ill., has issued an attractive booklet entitled "The Gift of Gifts."

Wiring Devices.—In a supplement to Catalog No. 16 issued by the Arrow Electric Company, Hartford, Conn., are described and illustrated various new and improved wiring devices.

Toy and Bell-Ringing Transformers.—In a folder issued by the Electric Manufacturing Company, Baltimore, Md., are described several different types of toy and bell-ringing transformers.

Electricity in the Woodworking Industry.—"Helping the Woodworker" is the subject of a bulletin recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Sewing-Machine Motor.—Folder No. 4152 sent out by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., describes a small motor designed for use with sewing machines.

Rigid Conduit.—The Western Conduit Company, Youngstown, Ohio, has issued a booklet on its enameled and galvanized conduit which goes into the detail of protecting the threads during the pickling process.

Kerosene Oil for Resistance Measurements.—Bulletin No. 402 published by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., describes the uses of kerosene oil for resistance measurements.

Vertical Rectifier.—A vertical rectifier, known as the "rexolux," designed for use with motion-picture apparatus, is described and illustrated in a bulletin published by the Electric Products Company, Cleveland, Ohio.

Electricity in Flour Mills.—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has recently published Folder No. 4287, which describes various types of electrical equipment designed for use in flour mills.

Electric Heating Apparatus.—The Simplex Electric Heating Company, Cambridge, Mass., has issued a ninety-six-page catalog which describes and illustrates the various heating appliances manufactured by the company.

Electric Steam Radiator.—A portable electric steam heater resembling an ordinary steam radiator is the subject of two leaflets published by the Electrical Steam Radiator Company, 644 Congress Street, Portland, Maine.

Electric Coal-Mining Machinery.—"Central-Station Power in Coal Mines" is the subject of Catalog No. 3002-A, Section No. 3078, recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Radial-Flow Steam Turbines.—"Stal Steam Turbine-Generators" is the subject of an attractively illustrated fifty-two-page catalog published by the Svenska Turbinfabriks Aktiebolaget Ljungström, Finspong, Sweden. The radial-flow turbine made by this company was described in the *Electrical World* of Nov. 29, 1914.

Electric Railway Apparatus.—In an attractively illustrated thirty-page bulletin designated as No. 44,003, recently issued by the General Electric Company, Schenectady, N. Y., are described various types of electric railway apparatus. Bulletin No. 44,300, issued by the same company, describes gas-electric motor cars and locomotives.

Magnet Wire.—The Western Electric Company has recently issued a folder which contains a price list of various types of magnet wire.

Rosettes and Receptacles.—The Western Electric Company has recently published a leaflet describing canopy-type rosettes and receptacles.

Alternating-Current Motor.—The Century Electric Company, St. Louis, Mo., has issued a folder which describes and illustrates a new 1/6-hp alternating-current motor.

High Candle-Power Incandescent Lamps.—A folder which shows several types of nitrogen-filled lamps, together with fixtures, is being sent out by the Western Electric Company, New York.

Small Motors.—Bulletin No. 41,500 issued by the General Electric Company, Schenectady, N. Y., describes and illustrates small direct-current and alternating-current motors of the drawn-shell type.

Decorative Portable Lamps.—"The Curtis Portable Lamp" is the title of an attractively illustrated catalog sent out by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill.

Wiring Devices.—The Steel City Electric Company, 1207 Columbus Avenue, Pittsburgh, Pa., has issued a catalog which describes various types of small wiring devices manufactured by the above company.

Cable-Testing Ammeters.—The Metropolitan Engineering Company, Forty-second Street Building, New York, has issued a leaflet, designated as Section 17, which describes a direct-current cable-testing ammeter.

Steel Pipe.—The National Tube Company, Pittsburgh, Pa., has issued an illustrated forty-six-page catalog, designated as No. 11C, which describes in detail various types of steel pipe which it is manufacturing.

Small Motors.—Catalog No. 24 published by the Western Electric Company, New York, is entitled "Knapp Motor Specialist," and it describes small motors operating on batteries and ordinary lighting circuits.

Single-Phase Motors.—In two folders entitled "Stop It" and "Single-Phase Facts" are enumerated certain features of the single-phase motors made by the Wagner Electric Manufacturing Company, St. Louis, Mo.

Heavy Machinery.—The E. W. Bliss Company, Brooklyn, N. Y., has issued an illustrated cloth-bound 840-page catalog which contains information on presses, punches, shears, lathes, sheet-metal-working machines, etc.

Electrical Apparatus.—The Western Electric Company has recently issued folders describing watt-hour meters, luminous radiators, an electric curling-iron heater, automatic time switches and ceiling receptacles.

War Names.—H. F. McConnell & Company, 25 Pine Street, New York, have published a circular listing names of European cities which are now interesting on account of the European war. It also gives the pronunciation.

Alternating-Current Generators.—The General Electric Company, Schenectady, N. Y., has issued a bulletin, designated as No. 40,500, which describes alternating-current generators for direct connection to reciprocating engines.

Excess Indicators.—The Pittsburgh Electric Specialties Company, 927 Pratt Street, Pittsburgh, Pa., has published a circular which describes two types of excess indicators and contains descriptions of various installations of these devices.

Incandescent Lamp Fixtures.—Various types of fixtures for high-candle-power incandescent-lamp fixtures are described and illustrated in Catalog No. 43, entitled "The Maxolite," issued by the Central Electric Company, Chicago, Ill.

Rheostats.—The Ward Leonard Electric Company, Bronxville, N. Y., has issued three circulars, designated as E-9, E-10 and E-11, which describe over-load, under-load and no-voltage circuit-breakers designed for small motors and batteries.

Wiring Devices.—In an attractive quarto-size, cloth-bound, 238-page catalog, which is illustrated in colors and which is designated as No. 1000, are described various types of electrical devices placed on the market by the Crouse-Hinds Company, Syracuse, N. Y.

Personal Mention

Mr. John M. Eshleman, president of the California Railroad Commission, has been elected Lieutenant-Governor of California and will therefore resign from the commission.

Mr. Douglas S. Martin, formerly with the *Electrical World*, which paper he left to join the British troops in the European war, has been badly wounded in the leg by a fragment of shell in the fighting around Ypres and is now in hospital at Boulogne. He was with the Sixteenth Lancers, one of the crack English cavalry regiments.

Mr. Oscar C. Turner, one of the best known electrical supply men in the country, is at present energetically at work on the arrangements for the forthcoming meeting of the electrical supply jobbers in Birmingham, Ala., since it was owing to his importunities that the jobbers decided to hold their forthcoming meeting in that city. Mr. Turner was born in Atlanta, Ga., June 1, 1874. He was educated in the schools of Atlanta and in the University of Georgia, and began his electrical career in 1891 with the Atlanta Railway & Light Company. He afterward went into the contracting business and later became general contracting agent for the Georgia Electric Light, Railway & Steam Heat Company. In 1898 he left Atlanta and joined the Chicago staff of the Western Electric Company, being later made manager of that company's apparatus department in Cincinnati. He left the employ of the Western Electric Company to become vice-president and general manager of the Southern Electric Company at Nashville. He was tempted to leave that position when the Peerless Lamp Works, of Warren, Ohio, offered him their managership. About five years ago Mr. Turner went to Birmingham to make it his home. He bought an interest in the Southern Wesco Supply Company, and about eighteen months ago he and his brother purchased the entire stock of the company and changed its name to the Turner Electric Supply Company. Mr. Turner is the eighth past-Jupiter of the Jovian Order and one of its most active workers. He has taken a prominent part in civic work in Birmingham and is a member of all the clubs, a director in the Fair Association, Business Men's League, Board of Trade and Chamber of Commerce, and was president of the Oscar W. Underwood Marching Club during Mr. Underwood's campaign for the Democratic nomination for the Presidency.

O. C. TURNER

Obituary

John C. Lott, manager of the New York office of the Fort Wayne Electric Works of the General Electric Company, died at his home in Freeport, N. Y., Nov. 24. Mr. Lott was born March 19, 1865. He began his work in the electrical industry with the Fuller Wood Company, Brooklyn, N. Y. Mr. Lott was also connected with the following concerns: The American Electric Manufacturing Company, New York; the Fort Wayne (Ind.) Jenney Company, the Chicago Arc Light & Power Company, the Citizens' Light & Railroad Company, Oswego, N. Y., and the Fort Wayne Electric Company, which later became the Fort Wayne Electric Works of the General Electric Company. Mr. Lott was employed by the latter company for over thirty-one years. His experience with the various companies with which he was connected was that of mechanic, mechanical and electrical expert, salesman and district office manager. He also at one time was electrical expert in the Brooklyn Navy Yard. Mr. Lott recently received a service medal from the Quarter Century Club of the General Electric Company. He was an associate member of the American Institute of Electrical Engineers and also a member of the Jovian Order and several societies and lodges.

Construction

New England

LYNDONVILLE, VT.—The contract for the concrete and masonry work for the new municipal electric-light plant has been awarded to the Twitchell Construction Co., of Lewiston, Maine. Contracts for equipment have not yet been awarded. Arrangements have been made with the village of West Burke to supply that village with electricity next summer.

NORWICH, CONN.—The Electric Light Commissioners expect to purchase within the next 30 days a Lee turbine feed-water pump connected to a Providence Iron Builders Co.'s pump. J. Kehoe is superintendent.

PLAINFIELD, CONN.—Within the next two months the Danielson & Plainfield Gas & El. Co., of Plainfield, expects to build a large addition to its turbine, boiler and pump rooms; also to purchase a 1000-kw General Electric turbine, a Wheeler surface condenser and one upright boiler, 97 in. by 23⅞ in. J. H. Burdick is superintendent.

SOUTH NORWALK, CONN.—The question of doing some underground work is under consideration by the South Norwalk Electric Works (municipal), and considerable ornamental street-lighting may be taken up during the coming year. As yet nothing definite has been decided upon. Albert E. Winchester is general superintendent.

Middle Atlantic

BATAVIA, N. Y.—The Board of Aldermen is considering a proposal submitted by H. K. Stein, superintendent of the Genesee Lt. & Pwr. Co., of Batavia, to supply energy to operate the municipal electric-lighting system. If the city should decide to abandon the municipal generating plant, new equipment involving an expenditure of $15,617 will be required.

GENEVA, N. Y.—The Central New York & Gas Co., of Geneva, has entered into a contract with the Geneva, Seneca Falls & Auburn Ry. Co. whereby it agrees to supply energy to the amount of 500 kw to operate the railway between Geneva and Seneca Falls for a period of 10 years. Electricity will be obtained from the plant of the Tracy Devel. Co., now under construction in Waterloo.

HUDSON, N. Y.—Bids will be received by Miss Mary Hinckley, president of board of managers New York Training School for Girls, Hudson, N. Y., until Dec. 19 for construction of hospital building, including heating, plumbing, elevators and electric work; construction of contagious hospital, including heating, plumbing and electric work; construction of storehouse, refrigerating plant and equipment, heating and plumbing and electric work at the New York Training School for Girls, Hudson, N. Y. Drawings and specifications may be obtained at the Department of Agriculture, Capitol, Albany, upon deposit of $10 for each branch of the work, which will be refunded upon return of same. Lewis F. Pilcher is state architect.

POUGHKEEPSIE, N. Y.—The Central Hudson Gas & El. Co., of Poughkeepsie, is contemplating extensions and improvements to its plant in Poughkeepsie at a cost of $125,000, and will include the installation of an 8000-kw turbo-generator, a large electric crane, extensions to transmission lines and erection of substations, etc.

NEW YORK, N. Y.—Bids will be received by the board of trustees of Bellevue and Allied Hospitals, Bellevue Hospital, 415 East Twenty-sixth Street, New York, until Dec. 4 for furnishing labor and materials required for excavation, masonry, carpentry, steel and iron work, metal work and roofing, painting and glazing, hardware, electrical work, refrigerating and drinking water and all other work in connection with the alterations to the present main building of the Harlem Hospital, 136th and 137th Streets and Lenox Avenue, borough of Manhattan. Bids will also be received at the same time and place for labor and materials for the masonry work, carpentry, ornamental iron work, structural steel and iron work, metal work and roofing, painting, hardware, electrical work, gasfitting, heating and ventilating, plumbing and other work in accordance with drawings and specifications for the alterations to the power house and ambulance station of the Harlem Hospital. Blank forms and further information may be obtained at the office of the contract clerk and auditor, 400 East Twenty-ninth Street, borough of Manhattan. John W. Brannan, M.D., is president.

ALLENTOWN, PA.—The Kolb Co. is erecting a large bakery in Allentown, at a cost of about $100,000. Approximately 50 hp in motors and 200 lighting units will be installed; electricity to maintain same will be supplied by the Lehigh Valley Lt. & Pwr. Co., of Allentown.

PHILADELPHIA, PA.—Among the new lighting projects contemplated by Chief Pike of the Electric Bureau for the next year is the installation of a new lighting system on the Northeast Boulevard the entire length from Broad Street to Rhawn Street, to cost about $90,000. The plans provide for the erection of 280 ornamental standards in the middle of the central driveway, each carrying twin electric lamps of 2000 cp each. An appropriation of $25,000 for the erection of new electric lamps in any part of the city as needed is also asked.

WILLIAMSPORT, PA.—The Citizens' El. Co., of Williamsport, which was recently awarded the contract for street-lighting, is preparing plans for the installation of a new street-lighting system, to cost about $20,000. The present plans provide for 225 4-amp magnetite-arc lamps and 36 4-amp series incandescent lamps. The system will be maintained by overhead wires. J. Fisher is president.

REHOBOTH, DEL.—Within the next two months W. S. Truitt, owner of the local electric-light plant, expects to erect about 4000 ft. of line wire for additional street lamps; also to purchase within the next six months an additional 100-kw, 220-volt generator directly connected to engine.

CANTON, MD.—The Hubbard Fertilizer Co., Fifth Avenue and Clinton Street, Canton, is contemplating the installation of an interior electric railway for fertilizer factory. W. H. Chapman is superintendent.

ABINGTON, VA.—The Bristol Gas & El. Co., of Bristol, Tenn., and Va., which was recently granted a franchise to supply electricity in Abington, will erect a 33,000-volt transmission line from Bristol to Abington (a distance of 15 miles) as soon as possible; also build a substation at the city limits of Abington (capacity 750 hp) and wire the town to distribute electricity for lamps and motors. S. M. Vance, of Bristol, is general manager.

WASHINGTON BARRACKS, D. C.—Bids will be received at the United States Engineer Depot, Washington Barracks, D. C., until Dec. 1 for furnishing six 12-in. exhaust fans and six 16-in. exhaust fans, 110-volt, 60-cycle, single-phase motor, complete with speed regulator. For further information address Joseph E. Kuhn, Lt.-Col. Corps Engineers, United States Army.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 8 for furnishing at the various navy yards and naval stations supplies as follows: Boston, Mass., Schedule 7590—one electrically driven dish-washing machine complete with motor. East and West, Schedule 7585—semi-annual supply prismatic reflectors, types J, K and L, semi-annual supply of clear and frosted globes; Schedule 7582—6700 5-amp watertight attachment plugs, without tips, 15,400 tips for 5-amp watertight attachment plugs. Norfolk, Va., Schedule 7598—58,300 lb. admiralty metal, seamless drawn, condenser tubes (⅝ in. outside diameter, 13 ft. 2¼ in. long), 3600 lb. hard drawn seamless brass tubing, 12-ft. lengths. Brooklyn, N. Y., Schedule 7591—Six 4-in. flanged brass reducing valves, 1900 lb. 48-in. by 72-in. soft sheet copper; Schedule 7598—1600 lb. round hard drawn bar copper, 12 ft. lengths; Schedule 7599—4500 ft. galvanized soft steel, leaded and armored interior communication cable, 900 ft. galvanized soft steel, leaded and armored, 11,000-circ. mil twin-conductor wire; Schedule 7586—575 ft. steel-armored, single-conductor submarine cable for 600 volts and less. Bids will also be received until Dec. 15 as follows: Mare Island, Cal., Schedule 7595—150 complete renewals for Edison batteries, type Q, 1060 brass key sockets, ¼-in. and ⅜-in. caps, 84 lb. nickel chromium alloy wire. Brooklyn, N. Y., Schedule 7606—two single-spindle, motor-driven sensitive drills, one motor-driven flat turret, 2-in. by 24-in. lathe, two motor-driven 3-ft.-bed, 10-in.-swing screw-cutting engine lathes, one universal motor-driven turret lathe, with geared friction head, 18-in. swing, 6-ft. bed, one motor-driven winding armature and field coil machine, f.o.b. works; Schedule 7603—one electrically driven hoist, five main hauling, equalizer and back-haul sheaves and one main sheave outrigger. Newport, R. I., Schedule 7604—one motor-driven spur and helical-gear shaper. Brooklyn, N. Y., Schedule 7605—one 125-volt variable-speed, motor-driven lathe, with extra attachments. Applications for proposals should designate the schedule desired by number.

North Central

ALPHA, MICH.—The contract for lighting the village, it is reported, has been awarded to the Manitowoc El. Co., of Manitowoc. The company is erecting a power plant in Alpha.

DETROIT, MICH.—Bids will be received by Charles A. Gadd, secretary board of education, Detroit, until Dec. 7 for the installation of electric wiring in a number of school buildings.

FREMONT, MICH.—The proposal submitted by the Muskegon-Grand Rapids Pwr. Co., of Grand Rapids, in regard to taking over the municipal electric-light plant will be submitted to the voters at an election to be called early in December.

NORTHVILLE, MICH.—The municipal electric-light plant has been leased to the Eastern Edison El. Co., of Detroit, for a period of four years at $2,520 per year. At the end of four years the company is to take over the plant for a consideration of $36,000, or turn it back to the village.

CINCINNATI, OHIO.—The board of directors of the University of Cincinnati will receive bids until Dec. 1 for the electrical work in the chemistry building, in accordance with plans and specifications on file in the office of Tietig & Lee, architects, Lyric Theater Building, Cincinnati. Further information may be obtained upon application to the architects or Walter G. Franz, engineer, Union Trust Building, Cincinnati, Ohio.

HOLMESVILLE, OHIO.—The Brown & Harris El. Co., recently incorporated with a capital stock of $3,500, is planning to install a small electric-light plant.

YOUNGSTOWN, OHIO.—H. W. Jones, consulting engineer, of Cleveland, has submitted his report to the City Council, which includes plans and approximate cost of a new street-lighting system, general data on commercial lighting and a distributing system and plans of a municipal electric plant and equipment; also plans for a hydroelectric plant at the Milton dam to light the city parks. The plans for the lighting system for the city provide for 3200 tungsten lamps for lighting the residential section of the city, mounted on brackets swung from poles at the side of the street. The cost of the installation is estimated at $160,000 and maintenance at about $49,280 per year. In the business district it is proposed to use 316 lamps mounted on ornamental standards. Of these 173 would be of 600 cp and 143 of 1000 cp. The cost of installing these lamps is estimated at $350,000, and $56.83 per year to maintain the 1000-cp lamps and $46.20 per year for the 600-cp lamps. To build a municipal plant it would be necessary to issue $900,000 in bonds. The cost of the hydroelectric plant at the Milton dam is estimated at $86,900, which would develop about 560 kw.

ZANESVILLE, OHIO.—The Southeastern Ohio Traction Co., it is reported, has been granted a franchise to furnish electricity for lamps and motors in Zanesville for a period of 35 years. Under the terms of the franchise the company is to light the city bridges free of charge.

CORBIN, KY.—At an election held recently the proposal to issue bonds for the installation of a municipal electric-light plant was carried.

HENDERSON, KY.—The City Council has appropriated $3,500 for repairs to the municipal electric-light plant. The boiler room was destroyed by a tornado last summer.

LOUISVILLE, KY.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 18 for a vacuum-cleaning system in the United States court house and post office at Louisville, Ky. For details see proposal columns.

PADUCAH, KY.—Plans are being considered, it is reported, by the Kentucky Southwestern El. Ry., Lt. & Pwr. Co., of Paducah, for the construction of power house, three substations, repair shop, carhouses, 1800-ft. trestle and several smaller ones in connection with a railway from Paducah to Murray, a distance of about 58 miles. H. C. Rhodes is president.

NEW PALESTINE, IND.—The Indiana & Cincinnati Lt. & Pwr. Co. has been granted a franchise to furnish electricity for lamps and motors in New Palestine. The company, it is understood, has also secured a contract for lighting the streets of the town.

CHICAGO, ILL.—During the next four years the Chicago, Milwaukee & St. Paul R. R. Co. will expend about $13,000,000 to equip its railroad in the Rocky Mountain district for electrical operation. A contract has been made with the General

Electric Co., of Schenectady, involving a preliminary expenditure of $2,000,000. C. A. Goodnow is in charge of the construction work.

GENEVA, ILL.—Bids will be received by the board of administration, Capitol Building, Springfield, Ill., until Dec. 7 for one farm cottage at the State Training School for Girls, Geneva. Separate bids will be received for general work, electric wiring, heating and plumbing. Plans and specifications may be obtained upon application to James B. Dibleka, state architect, 29 South LaSalle Street, Chicago, Ill.

KANKAKEE, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, until Dec. 14 for the erection of a contagious disease building at the Kankakee State Hospital. Separate bids will be received for general work, heating, electric wiring and plumbing. Plans and specifications may be obtained on application to James B. Dibelka, state architect, 29 South LaSalle Street, Chicago, Ill.

SPRINGFIELD, ILL.—The City Commissioners have decided to reject the offer of the Springfield Utilities Co. to take over the municipal lighting plant and light the streets of the city for $30,000 less a year than it is now costing the city. The city has recently purchased a new 750-kva turbo-generator, which will be installed in the auxiliary pumping station. The present municipal electric-light plant will eventually be abandoned.

MADISON, WIS.—Bids will be received by M. E. McCraffrey, secretary of the University of Wisconsin, Administration Building, Madison, until Dec. 15 for the entire construction of the Physics Building of the University of Wisconsin. Plans may be seen at the Builders' Exchanges in Milwaukee, Wis.; Chicago, Ill.; Minneapolis and St. Paul, Minn., and Madison, Wis. Plans may be obtained at the office of the architect of the University of Wisconsin, Administration Building, Madison, upon deposit of $10, to be refunded upon return of same.

SHEBOYGAN, WIS. — The Milwaukee Northern Ry. Co., it is reported, is preparing plans for installing a substation in Belgium to supply electricity for lamps and motors in the surrounding country. Arrangements, it is understood, have been made to furnish electricity in Random Lake.

HIBBING, MINN.—The Home El. Co., it is reported, has been awarded the contract to erect a transmission line from Hibbing to Alice, at a cost of $7,200.

MADISON, MINN.—J. C. Bang, superintendent of the municipal electric-light plant, would like to receive information and prices on a motor-driven feed-water pump for 300-hp boilers.

ST. PAUL, MINN.—All bids submitted for electric lighting have been rejected by the City Council. An attempt, it is understood, will be made at a conference between the purchasing committee and technical officers of the city and Paul Doty, manager of the St. Paul Gas Lt. Co., to reach an agreement before further bids are asked. The city, it is announced, wishes to maintain all the lamps owned by the city and hopes to get the company to submit bids for energy to maintain 300 ornamental lamps and 425 new nitrogen-filled lamps, of which it is proposed to install 425 the coming year.

SLAYTON, MINN.—The Slayton Pwr. Co. expects to purchase ornamental posts for five-lamp clusters, 60-cp, type "C," series 6.6-amp lamps, and underground cable and conduit to connect the center lamps on one circuit and the lower lamps on the other circuit; also 32 lamps of 80-cp center suspension type to be maintained by the same circuit, with transformers and other necessary equipment for same. F. H. Eddy is manager of the company.

NORA SPRINGS, IA.—At an election held recently the proposal to grant M. True, of Ladysmith, Wis., a 25-year franchise to supply electricity in Nora Springs was carried.

OELWEIN, IA.—The Fayette Utilities Co., of Oelwein, has awarded a contract to Schmidt Brothers Construction Co., 105 North Park Street, Chicago, Ill., for construction of a power plant.

MICHIGAN, N. D.—Preparations, it is reported, are being made for the installation of a municipal electric-light plant in Michigan, for which bonds have been voted.

MINOT, N. D.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 14, for installation of an electric passenger elevator in the United States post office and court house, Minot, N. D., in accordance with plans and specifications, copies of which may be obtained at the above office. O. Wenderoth is supervising architect.

STANLEY, N. D.—Bids will be received by the Board of County Commissioners of Mountrail County at the office of the county auditor, Stanley, until Dec. 22 for furniture, electric-light fixtures and decorating of the county court house in Stanley, for which separate bids will be received as follows: (A) Furniture; (B) decorating; (C) electric fixtures. Plans and specifications may be seen at the office of W. C. Gibb, county auditor, Stanley, and at the office of Buechner & Orth, architects, 500 Shubert Building, St. Paul, Minn.

CHAMBERLAIN, S. D.—The power house of the Chamberlain Gas Lt. & Pwr. Co., it is reported, was damaged by fire recently. The plant, it is understood, will be rebuilt.

ABILENE, KAN.—The Riverside Lt. & Pwr. Co., of Abilene, expects to purchase within the next six months a 250-hp water-tube boiler. C. L. Brown is manager.

CANTON, KAN.—The municipal electric-light plant was recently destroyed by fire, causing a loss of about $5,000.

HANOVER, KAN.—Within the next two months the town of Hanover expects to purchase a transformer and motors for the municipal electric-light plant. J. G. Granzer is superintendent.

Southern States

AMERICUS, GA.—The Americus Pwr. Co. and the Public Utilities Co., both of Americus, have been consolidated under the name of the Americus Pub. Ser. Co. The plant of the Americus Pwr. Co. will be dismantled and sold in about three and one-half months. J. Emory Mathias, manager of the Americus Pwr. Co., has assumed the management of the consolidated properties.

FLORENCE, ALA.—Arrangements, it is reported, have been made whereby the Lauderdale Pwr. Co. and the Allentown Pwr. Co. have been consolidated under the name of the Lauderdale Pwr. Co. The new company is capitalized at $400,000 and proposes to develop the water-power in Cypress and Shoal Creeks. The officers of the company are: Sloan Jacobs, president; Alan Jemison, vice-president; Thurston Allan, secretary and general manager, and T. W. Pratt, treasurer.

MOBILE, ALA.—W. M. Weems, of Dayton, Ohio, it is reported, is contemplating the construction of a vitrified-brick factory and electric-light plant in Mobile.

FORT SMITH, ARK.—Arrangements are being made by several of the merchants on Garrison Avenue to install an electric-light plant to light the stores and business houses from Sixth to Ninth Street on Garrison Avenue.

LAKE CHARLES, LA.—Plans are being considered by the Commercial Club for the installation of an ornamental street-lighting system in the business district.

DUNCAN, OKLA.—The Duncan El. & Ice Co., controlled by the Southwestern Cities El. Co., is contemplating the installation of gas engines in the near future. John C. Keyes, of Lawton, is president.

TEMPLE, TEX.—The City Council has awarded the Texas Pwr. & Lt. Co. a new street-lighting contract. The contract is for a period of five years and provides for 43 additional lamps.

Pacific States

ARLINGTON, WASH.—The Jim Creek Wtr., Lt. & Pwr. Co., of Arlington, has petitioned the County Commissioners of Snohomish County for a franchise to erect and operate electric transmission lines along certain county roads from Arlington, Springfield, Bryant, Milldale, Pilchuck to McMurray to the north line of the county; also from Arlington to Norman, through Silvana; also from Arlington to Oso, through Trafton and Cicero. The company proposes to supply electricity to the above-named towns and to ranchers along the line.

EVERETT, WASH.—The Riverside Business Men's Association has appointed a committee to investigate the feasibility of installing an incandescent street-lighting system on Hewitt Avenue east of the viaduct.

RIDGEFIELD, WASH.—John L. Bratlie and William McClelland, of the Bratlie-McClelland Shingle Mill Co., of Ridgefield, have applied to the City Council for a franchise to supply electricity in Ridgefield. Preparations are being made by the company to enlarge its power plant at the mill on Lake River. A new boiler and additional generating machinery will be installed. This equipment has not yet been purchased.

TACOMA, WASH.—The City Council is contemplating the installation of new luminous-arc lamps on South D Street from Seventh to Twenty-first Street, work on which will probably start soon after the first of the year.

SILVERTON, ORE.—The City Council is considering the installation of a complete electric-lighting system to cover the entire city. It is proposed to erect cluster lamps in the business district and single lamps in the outlying sections. Bids, it is understood, will soon be asked for furnishing equipment and installing the same. Bids will also be asked for furnishing energy to maintain the system for a period of five years.

NEWPORT BEACH, CAL.—The contract for the ornamental street-lighting system in Newport Beach has been awarded to the F. O. Engstrom Co., of Los Angeles, at $17,728. The plans provide for 138 ornamental standards.

SAN FRANCISCO, CAL.—Bids, it is reported, are being received by the Board of Public Works for furnishing and installing equipment in the civic center power plant, to be situated at McAllister and Larkin Street and to cost about $16,000.

STOCKTON, CAL.—Plans adopted by the City Council for the street-lighting for the coming year provide for 600 or more nitrogen-filled lamps. At present there are few over 500 lamps in use. The new lamps will be erected in the recently annexed territory. Included in the plans for 1915 are electroliers for the business district.

TULARE, CAL.—Plans have been presented to the City Council by a committee from the Merchants' Association for an ornamental street-lighting system for the business district. The plans provide for the erection of 50 electroliers and for laying of about 8000 ft. of conduit.

TUCSON, ARIZ.—At an election to be held Dec. 14 the proposal to issue $35,000 in bonds for street-lighting will be submitted to the voters.

BOZEMAN, MONT.—Bids will be received by A. M. Branderburg, city clerk, until Dec. 3 for furnishing electricity for lighting the city during the coming year.

Canada

OTTAWA, ONT.—The erection of a duplicate transmission line to the Lemieux Island pumping plant has been recommended by the Board of Control.

PETERBOROUGH, ONT.—The installation of a new street-lighting system is reported to be under consideration by the Utilities Commission.

SWANSEA, ONT.—The Council has adopted a resolution to enter into a contract with the Hydro-Electric Commission for energy for street and commercial lighting.

YORK, ONT.—The Toronto Hydro-Electric Commission has been authorized by the York Township Council to erect 140 street lamps in the Runnymede and Swansea districts of Toronto.

Miscellaneous

NOME, ALASKA.—Arrangements are being made by the Seward Peninsula Pwr. Co., of Nome, for improvements to its power house and extensions to its system. A. J. McConnell is superintendent.

PANAMA.—Bids will be received at the office of the general purchasing officer, Isthmian Canal, Washington, D. C., until Dec. 7 for steel cable, boiler tubes, miscellaneous pipe fittings, clean-outs, bibbs, ells, sheet copper, soft-rolled copper, structural steel work, etc. Blanks and general information relating to this circular (No. 878) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

New Incorporations

MALTA, MONT.—The Malta Lt. Co. has been incorporated with a capital stock of $10,000 to construct and operate an electric-lighting plant.

LOCUST GROVE, OKLA.—The Locust Grove Lt. & Pwr. Co. has been incorporated with a capital stock of $10,000 by H. O. Long and O. W. Killum, of Locust Grove, and Thomas McCrowsky, of Webb City, Mo.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED NOV. 17, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,117,156. Secret Telephone Exchange; R. M. Beard, New York, N. Y. App. filed May 2, 1904. Prevents "listening in."

1,117,184. Controller; H. E. Goldberg, Chicago, Ill. App. filed Nov. 23, 1910. For copying, typesetting and sorting machines.

1,117,185. Electrolytic Cell; A. M. Griffin, Kansas City, Mo. App. filed April 27, 1914. The hydrogen and oxygen produced are collected and stored.

1,117,191. Motor-Starting Rheostat; G. McD. Johns, St. Louis, Mo. App. filed Oct. 25, 1909. Centrifugally operated.

1,117,198. Electric-Circuit-Controlling Apparatus for Train-Lighting and Similar Systems; E. H. M. Langley and E. W. Price, Birmingham, Eng. App. filed July 24, 1911. Special switch construction.

1,117,201. Internal-Combustion Engine; R. H. Libke, Chilton, Wis. App. filed June 13, 1914. Magneto is geared to the crank shaft at a speed ratio of 2½ to 1.

1,117,211. Linemen's Chair; F. W. Mayes, Hopkinsville, Ky. App. filed May 5, 1913. Accidental displacement from the messenger wire is prevented, the chair having a cable-supporting roller.

1,117,212. Automatic Telephone Exchange Apparatus; F. R. McBerty, New Rochelle, N. Y. App. filed April 20, 1909. Testing connection and restoration in a final selector are performed automatically.

1,117,215. Telephone-Toll Device and Circuits Therefor; J. L. McQuarrie, Montclair, N. J. App. filed Oct. 12, 1912. Improved and reliable system for charging the number of successful calls.

1,117,231. Loud-Speaking Transmitter; J. C. R. Palmer, Brooklyn, N. Y., and A. P. Pinkler, Weehawken, N. J. App. filed Nov. 13, 1911. Special construction for long-distance work.

1,117,240. Method of Insulating Wire of Aluminum and the Like; E. Presser, Berlin, Germany. App. filed May 31, 1911. Passes wire through an electrolyte while conducting high-tension current through it.

1,117,266. Fluoroscopic Apparatus; H. C. Snook and E. W. Kelly, Philadelphia, Pa. App. filed Dec. 26, 1911. For shielding physician from X-rays emanating directly from the source and from secondary sources.

1,117,267. Vacuum Regulation; H. C. Snook, Philadelphia, Pa. App. filed June 18, 1912. Uses a mixture of asbestos and powdered clevite.

1,117,277. Heating Apparatus; S. G. Supplee, East Orange, N. J. App. filed May 12, 1914. Heating element adjustably supported in a liquid container.

1,117,290. Semi-Automatic Telephone System; A. W. Weiss, Chicago, Ill. App. filed March 28, 1908. Switchboard has no answering jacks and no signals individual to the lines terminating in the board.

1,117,293. Induction Coil; D. H. Wilson, Chicago, Ill. App. filed March 25, 1909. For telephone systems.

1,117,296. Impulse Transmitter; J. A. Wotton, Montclair, N. J. App. filed June 14, 1912. Includes special clockwork mechanism.

1,117,297. Telephone Exchange Systems; J. L. Wright, Washington, D. C. App. filed May 18, 1906. Full-automatic system in which the double-selective motion of the switch is eliminated.

1,117,329. Tire-Pressure Indicator and Electric Signal; C. C. Cleveland, Boulder, Col. App. filed May 6, 1912; renewed March 28, 1914. Signals deflation of any tire.

1,117,335. Speed Indicating and Signaling Device; J. Coplon, Buffalo, N. Y. App. filed May 1, 1912. Speedometer closed circuit indicates exceeding of speed limit.

1,117,339. Electric Regulation; J. L. Creveling, New York, N. Y. App. filed Feb. 16, 1912. For charging storage batteries.

1,117,347. Electric Thermostatic Fire-Alarm Contacts; H. Dixon, Toronto, Ontario. App. filed Dec. 26, 1912. Contacts inclosed in hermetically sealed chamber.

1,117,361. Speed Control for Motors; S. K. Evans, Elmsford, N. Y. App. filed Nov. 8, 1913. Speedometer shuts off motor at speed which is predetermined by a key-controlled lock.

1,117,376. Circuit-Controller; C. O. Harrington, Edgewood, Borough, Pa. App. filed Dec. 28, 1912. Applied to an electric bell of the solenoid and plunger type.

1,117,378. Combined Generating and Starting Apparatus for Gas Engines; J. A. Heany, Flint, Mich. App. filed July 28, 1910. An auxiliary engine, after being started by the motor dynamo, drives the main engine.

1,117,392. Fuel-Vaporizing Device; C. F. Johnson, Detroit, Mich. App. filed July 3, 1914. Electric heater interposed in engine intake to collect and vaporize any condensed fuel.

1,117,396. Circuit-Controlling Device; M. M. Kandle, Springfield, Mass. App. filed Nov. 6, 1912. Paper-operated stop for printing presses.

1,117,407. Telephone System; E. Land and F. L. Fisher, Grand Rapids, Mich. App. filed March 22, 1906. Automatic distribution of calls coming into a central office.

1,117,441. Third-Rail Contact; S. Przespolewski, Carnegie, Pa. App. filed July 3, 1914. Contact wheel made in independently rotatable sections..

1,117,473. Steering-Wheel Heater for Road Vehicles; W. P. Barton, Idaho Falls, Idaho. App. filed May 5, 1914. Made in segments readily applicable to an ordinary steering wheel.

1,117,484. Electric Bell; C. W. Dunham, Swissvale, Pa. App. filed Feb. 4, 1914. Solenoid and plunger type, with plunger supported on an inclined ball race.

1,117,485. Electromagnet; O. F. Forsberg, Yonkers, N. Y. App. filed Aug. 31, 1911. Positive operation of the magnet is insured; illustrated as controlling a pay-station coin chute.

1,117,493. Method of Charging Secondary Batteries; M. R. Hutchinson, West Orange, N. J. App. filed July 6, 1911. Renders impossible charging of the battery with all the cells connected together in series.

1,117,511. Automatic Trunk Signaling System; F. R. McBerty, New Rochelle, N. Y. App. filed Sept. 19, 1910. Manual operator is automatically informed of the designation of the line with which connection is desired.

1,117,553. Selective Switching Apparatus; E. B. Craft, Hackensack, N. J. App. filed Aug. 10, 1912. For automatic or semi-automatic systems.

1,117,559. Railway Signaling; W. F. Follett, New Haven, Conn. App. filed Nov. 1, 1914. Uses alternating-current signaling circuits.

1,117,588. Electric Hoist; G. K. Mitchell, Baltimore, Md. App. filed March 13, 1912. Particularly for dumbwaiters.

1,117,590. Inclosed Fuse; W. J. Morgan, St. Louis, Mo. App. filed Aug. 20, 1913. Constructed so as to be readily assembled.

1,117,599. Lightning Arrester; H. M. Pingen, Toledo, Ohio. App. filed April 27, 1914. Cartridge lightning arrester with an embracing sectional shield having a spark-gap.

1,117,616. Magneto Machine; L. A. Williams, Evanston, Ill. App. filed Nov. 17, 1913. For make-and-break ignition.

1,117,633. Signaling System; C. E. Beach, Binghamton, N. Y. App. filed Dec. 24, 1913. Interference prevented between different alarm-transmitting stations.

1,117,646. Circuit Closer; V. Durbin, Newton, and H. Ehrismann, Boston, Mass. App. filed May 9, 1913. Push-button of the self-locking type employed in hospital signaling systems.

1,117,647. Watertight Attachment Plug and Receptacle; V. Durbin, Newton, Mass. App. filed Oct. 2, 1913. Toggle-operated closure seals receptacle when plug is withdrawn.

1,117,650. Detachable Lamp Socket; M. Erlanger, Baltimore, Md. App. filed Dec. 30, 1913. Socket has terminal spurs which pass through conductor wires into a wooden or like support.

1,117,675. Automatic Mechanism for Recalling Chronological Data; D. W. Jewell, Kalamazoo, Mich. App. filed Feb. 18, 1914. For indicating expiration of a prison sentence, recalling engagements, etc.

1,117,681. Spark-Gap for Wireless Telegraphy; J. Loeffler, Vallejo, Cal. App. filed March 17, 1913. A cooling chamber surrounds the electrode.

1,117,689. Electrical Regulator; C. A. Moore, Johnstown, Pa. App. filed May 17, 1911. For boosters used in connection with storage batteries.

1,117,706. Fire-Alarm Box; E. L. Rowley and G. H. Gibson, Detroit, Mich. App. filed March 5, 1914. Traps and holds the person sounding the alarm.

1,117,722. Track-Controlled Mechanism; A. H. Sweetland, Long Beach, Cal. App. filed Dec. 15, 1913. Magnetically operated track switch.

1,117,731. Dynamo-Electric Machine; H. B. Weir, Milwaukee, Wis. App. filed Feb. 14, 1910. Reinforced commutator construction.

1,117,738. Internal-Combustion Engine; A. Winton, Cleveland, Ohio. App. filed Dec. 13, 1912. For heavy-grade oil; has a commutator by which the amount and the time of admission of the fuel can be controlled.

1,117,748. Molding or Conduit for Electric Wires; P. Adison, New York, N. Y. App. filed July 10, 1913. Trough and flanged cover which is narrower than the base of the trough so that water cannot drip down into the joint between trough and cover.

1,117,766. Submarine Signaling Apparatus; C. Berger, New York, N. Y. App. filed Nov. 4, 1912. Interiorly supported microphone with jelly-like vibration-transmitting medium.

1,117,815. Sleet Cutter for Trolley Wires; H. E. Eager and A. O. Hagle, Tipton, Ind. App. filed Feb. 17, 1914. Supported so as to be thrown into and out of operation.

1,117,832. Signaling System; H. C. Goldrick, San Francisco, Cal. App. filed Jan. 30, 1913. Used in signaling telephone substations.

1,117,837. Induction Coil Casing; H. D. Grinnell, Pittsfield, Mass. App. filed April 19, 1911. Coil completely protected from rain and snow.

1,117,857. Circuit Interrupter for Therapeutical Apparatus; F. M. and M. H. Kidder, New York, N. Y. App. filed Jan. 7, 1914. Adjustment of armature of the interrupter.

1,117,864. Signaling System; M. E. Launbranch, Chicago, Ill. App. filed Oct. 24, 1911. Central station and plurality of substations all used on the same circuit.

1,117,872. Dynamo-Electric Machine and System of Control; R. Lundell, New York, N. Y. App. filed Nov. 28, 1913. Motor-generator system.

1,117,879. Electrolytic Cell; F. McDonald, Roaring Spring, Pa. App. filed April 20, 1914. Intermingling of the anode and cathode products is prevented.

1,117,888. Safety Appliance for Elevators; J. Munkacsy, Newark, N. J. App. filed March 3, 1914. Circuit-breaking device suspended below floor of car.

1,117,907. Apparatus for Indicating the Direction of the Wind; G. T. Richardson, London, Eng. App. filed Dec. 15, 1911. Wind vane controlling an electrically illuminated dial.

1,117,950. Immersion Heater; E. J. Ovington, Los Angeles, Cal. App. filed Dec. 1, 1911. Joint between cap and casing of the heater is copper-plated to make it watertight.

13,830 (reissue). Transformer; N. A. Wolcott and W. C. Woodland, Warren, Ohio. App. filed May 13, 1914. (Original patent No. 1,091,395, March 31, 1914.) Special laminated-core construction.